


Aquatic Reserve Site Evaluation Criteria and Ecological Framework

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Purpose and Audience

The purpose of this document is to provide guidance to Washington Department of Natural Resources (WDNR) regarding the implementation of the Aquatic Reserve Program. Specifically, this document implements the Aquatic Reserve designation criteria as described in the Final Environmental Impact Statement (FEIS) for the Aquatic Reserve Program (3.2.1.3.4). Additionally, this document builds upon the FEIS (September 2002) in order to further describe the ecological framework, provide the basis for Aquatic Reserve establishment, and to describe the goals associated with the program. A separate document provides guidance for the administrative implementation of the Aquatic Reserve Program. This document will guide Washington Department of Natural Resources as it evaluates Aquatic Reserve proposals and allows resource managers and the public to examine the review Aquatic Reserve process and purpose.

Washington Department of Natural Resources

The Washington Department of Natural Resources manages approximately 2.4 million acres of state-owned aquatic lands. This includes approximately 1,300 miles of tidelands, 6,700 acres of constitutionally established harbor areas and all of the submerged land below extreme low tide. The total area of aquatic lands under management amounts to some 2,000 square miles of marine beds of navigable waters and an undetermined amount of fresh water shoreland and bed. Maps depicting the distribution of aquatic land ownership in fresh and marine waters are shown in figures 1 and 2. These lands are managed as a public trust and provide a rich land base for a variety of recreational, economic and natural process activities. Management concepts, philosophies, and programs for state-owned aquatic lands should be consistent with this responsibility to the public. These lands are "a finite natural resource of great value and an irreplaceable public heritage" and will be managed to "provide a balance of public benefits for all citizens of the state" (RCW 79.90.450 and 79.90.455).

Management of state-owned aquatic lands will strive to:

(a) Foster water-dependent uses;
(b) Ensure environmental protection;
(c) Encourage direct public use and access;
(d) Promote production on a continuing basis of renewable resources;
(e) Allow suitable state aquatic lands to be used for mineral and material production; and
(f) Generate income from use of aquatic lands in a manner consistent with the above goals.

To achieve the above, state-owned aquatic lands will be managed particularly to promote uses and protect resources of statewide value. Management methods include:

(a) Planning will be used to prevent conflicts and mitigate adverse effects of proposed activities involving resources and aquatic land uses of statewide value.
(b) Areas having unique suitability for uses of statewide value or containing resources of statewide value may be managed for these special purposes.
(c) Special management programs may be developed for those resources and activities having statewide value.
(d) Water-dependent uses shall be given a preferential lease rate. Fees for nonwater-dependent aquatic land uses will be based on fair market value.
(e) Research and development may be conducted to enhance production of renewable resources. (WAC 332-30-100)

Figure 1: Navigable Freshwater Aquatic Lands

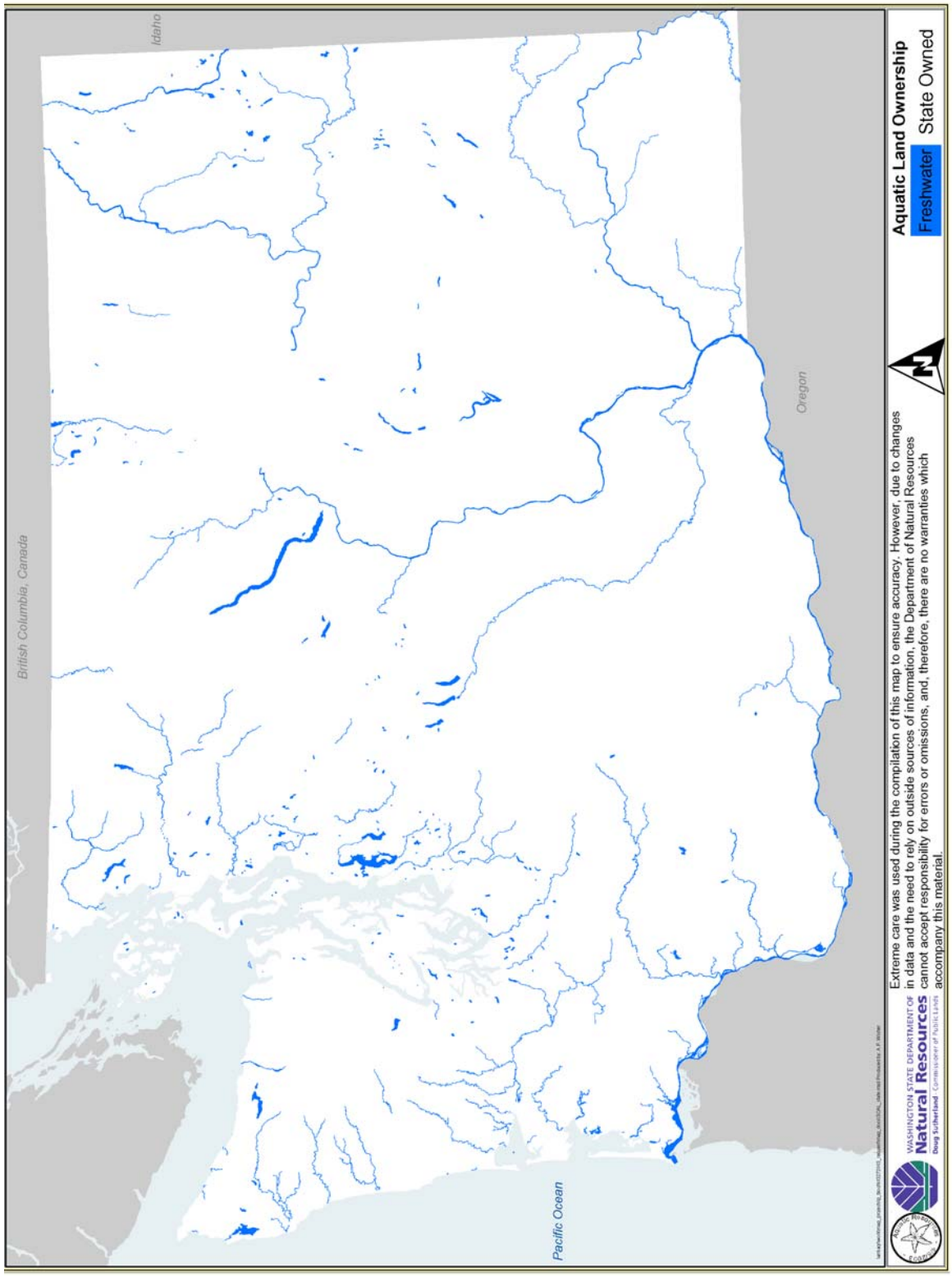
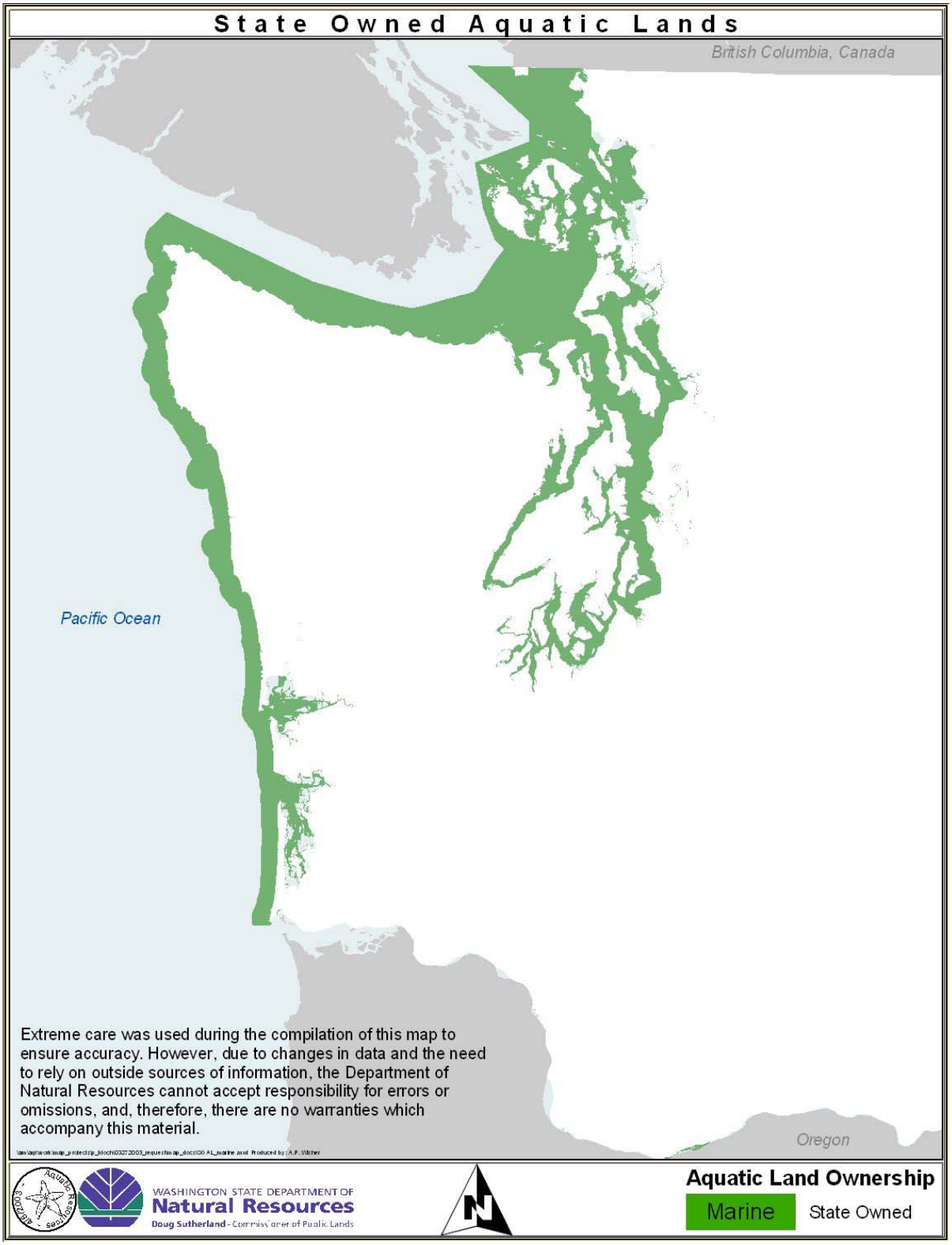


Figure 2: State Owned Marine Aquatic Lands



Aquatic Reserves Program

WDNR is provided with the proprietary authority to identify and withdraw lands from conflicting uses (RCW 79.68.060), and has specific direction to protect aquatic lands of special educational or scientific interest or aquatic lands of special environmental importance threatened by degradation by designating areas as Aquatic Reserves (WAC 332-30-151).

Although wildlife, fish and shellfish are also property of the state of Washington, most of these resources are managed separately by the Washington Department of Fish and Wildlife (RCW 77.04.012). Management of fishery resources is governed by treaties that assure the rights of many tribes to harvest fish and shellfish within their usual and accustomed fishing areas in Washington (Treaty of Olympia 1865, Treaty of Medicine Creek 1854, Treaty of Neah Bay 1855, Treaty of Point Elliott 1855, and Treaty of Point No Point 1855) as confirmed by the "Boldt Decision" (United States v. Washington 1974). While the "Belloni Decision" (Sohappy v. Smith/U.S. v. Oregon 1969) provides that the state may regulate fisheries when "reasonable and necessary for conservation," the subsequent "Boldt Decision" offers that State regulations affecting tribal fisheries that go beyond conservation are illegal.

While the Aquatic Reserve Program may benefit fisheries, the management of fisheries is outside the scope of this program. Thus, the Aquatic Reserve Program leaves unchanged the management of fishery resources by WDFW and tribal co-managers. However, the Aquatic Reserve Program will, where appropriate, seek to work cooperatively with these fishery managers to provide for the conservation of aquatic ecosystems. Many other resource managers play important roles in managing aquatic resources in Washington State; these managers, their authorities and responsibilities are further described elsewhere (FEIS 2.5). The Aquatic Reserve Program will seek to work cooperatively with other landowners, citizens, stakeholder groups, Tribes and regulatory agencies in the development of management plans for individual sites in order to maximize the benefits for individual reserves and the ecosystem.

Goals and Objectives for Aquatic Reserve Program

The Aquatic Reserves Program will designate and manage aquatic lands as Aquatic Reserves as partial fulfillment of the Department of Natural Resource's stewardship responsibilities for state owned aquatic lands and associated resources. During 2002, WDNR developed a programmatic Final Environmental Impact Statement (FEIS) in compliance with the State Environmental Policy Act (SEPA) that outlines program goals and objectives. This document provides additional detail and implementation of guidance contained in the FEIS. Goal setting for the Aquatic Reserve Program, including the elaboration of objectives, is critical to the determination of expectations, effective design of the reserve, and establishment of targets and benchmarks against which progress toward the objectives can be measured (Agardy 2000). As identified in the FEIS (3.2.1.1), the overall goal of the Aquatic Reserves program is to ensure environmental protection, preservation and enhancement of state owned aquatic lands that will provide direct and indirect benefits to aquatic resources in the state of Washington. Because many managers have only partial authority, achieving this goal will require partnerships among natural resource managers including landowners. Components of this overall goal identified in the FEIS include:

Protect aquatic biodiversity

Mechanism

- Conservation by maintaining ecosystem integrity, function and biodiversity
  - Work with other managers to ensure protection of rare, localized, or endemic species
  - Protect areas essential for all life history phases of species and successional stages
  - Minimize and distribute risk from anthropogenic disturbances
  - Prevent invasions by and remove non-native invasive species and genotypes
  - Restore or maintain habitats and ecosystem processes necessary for target species and ecosystem species viability
  - Reduce or eliminate threats to target species and target species' habitat
  - Protect habitat used by exploited species at sites and/or life history stages where they are vulnerable
- Representation of important habitats
  - Provide adequate protection and coverage of representative habitats, species and communities
  - Protect ecological processes essential for habitat existence
  - Minimize threats/damage to habitats from activities inside and/or outside the Aquatic Reserve

Provide educational and research opportunities

Mechanism

- Maintain undisturbed areas of marine habitats for educational exploration and baseline monitoring
- Provide opportunities for large-scale manipulation or observation of aquatic habitats or ecosystem processes for research purposes
- Enhance scientific knowledge, particularly of aquatic ecosystems and ecosystem processes

Ensure effective and equitable stakeholder representation and participation

Mechanism

- Build resource users capacity to participate in co-management arrangements
- Make publicly available for review information and data used to select sites and develop management plans

These components and mechanisms underpin the program and provide a tool for monitoring the success of the program. In the future WDNR will seek to develop measurable objectives related to these components and mechanisms. By tracking the success of the Aquatic Reserve Program in achieving its overall goal, the program will employ adaptive management by preferentially selecting reserves and management strategies that focus on goals and objectives that are not being achieved.

The overall goal and related components will be achieved through the designation of three classes of reserves: environmental reserves, scientific reserves, and education reserves (WAC 332-30-151). The FEIS (3.2.1.2) delineates roles and objectives for each of these reserve types in working towards achieving the overall program goal. 1) Environmental Reserves will help achieve the program goal through conservation and restoration. Progress towards these objectives will be developed through baseline monitoring and review of key species, communities and ecosystem functions. 2) Scientific Reserves will help achieve the program goal by providing sites that can be manipulated for the benefit of knowledge, and by providing reference sites against which to measure effectiveness of environmental protection. 3) Educational reserves further these goals by making sites available for educational opportunities and educating people about the value of aquatic habitats.

Relationship to Other Protected Areas Programs

The Aquatic Reserve Program will seek to achieve the aforementioned goals and objectives by designating specific sites under Washington WDNR's proprietary control as Aquatic Reserves. Spatial and temporal management in the form of protected areas ensure that the benefits of management are extended beyond the target areas to wider segments of ecosystems (Davis 1989).

This program is one of several mechanisms developed by state, federal and local governments so further protection of marine resources through place-based management (table 1). No comparable systematic review of institutions and designations mechanisms exists for freshwater aquatic areas, however several of those listed in table 1 also apply to freshwater areas. Like other parts of the world, the aquatic lands of Washington are deteriorating as a result of pollution effects, fisheries management failures, fishery–induced ecosystem changes, in addition to human population expansion and associated development (Vitousek et al. 1997). Wetland and submerged land habitats have been altered and although wetland habitat loss in major estuary systems has been quantified (Bortelson 1980, Levings and Thom 1994), quantities of other types of aquatic habitat lost due to development remain a matter of speculation. In response to these challenges managers have sought to identify effective means to reduce and manage threats, slow or reverse ecosystem changes, and effectively manage harvest resources. Terrestrial conservation has long used reserve systems to manage similar threats, however aquatic conservation efforts have lagged behind and only recently has it adapted the concept of protecting areas from land conservation (Sloan 2002). Many lessons about the appropriate size, placement and management of protected areas have been developed in the terrestrial environment. However, because of their nascent stage of development, and life-history differences (primarily the ubiquity of larval dispersal in marine systems), results from terrestrial reserves do not transfer easily to aquatic protected areas (e.g., Simberloff 2000). Protecting areas is enticing in part because reports indicate that reserves are among the most efficient and cost-effective ways to conserve biological diversity (Balmford et al. 1995).

Table 1: Institutions and designation mechanisms associated with existing protected areas (Adapted from Murray 1998).

Institution	Designation Type(s)
WASHINGTON STATE	
Department of Natural Resources (WDNR)	Aquatic Reserve*
	Natural Area Preserve
	Natural Resources Conservation Area
Department of Fish and Wildlife (WDFW)	Conservation Area*
	Marine Preserve
	Seabird Sanctuary
	Special Management Fishery Area
	Wildlife Area
Parks and Recreation Commission (WSP&RC)	State Parks (developed)
Department of Ecology	National Estuarine Research Reserve
University of Washington	
Friday Harbor Laboratories	Marine Biological Preserve
FEDERAL	
U.S. Fish and Wildlife Service (USFWS)	National Wildlife Refuge
National Oceanic and Atmospheric	
Administration (NOAA)	National Estuarine Research Reserve
	National Marine Sanctuary
National Park Service (NPS)	National Park
LOCAL GOVERNMENT	
City of Edmonds	Underwater Park
City of Tacoma	Marine Preserve
Clallam County	Marine Life Sanctuary
San Juan County	Voluntary Bottomfish Recovery Areas
PRIVATE SECTOR	
Various Land Trusts (e.g., The Nature Conservancy)	Preserve

*Denotes designation types developed since 1998

WDNR's Aquatic Reserve Program is part of a larger movement that has advanced in Washington State to develop specially managed areas to protect aquatic species, habitats and ecosystems (Murray 1998). Driving this regional interest in protected areas has been increasing awareness and mounting evidence of ecosystem stress and degradation, and resultant efforts to find new solutions to such problems. Protecting areas may be an effective mechanism to counteract habitat loss and alteration, resource declines and numerous other aquatic environmental problems (e.g., Mahaffy et al. 1994; Marine Science Panel 1994; Palsson et al. 1996; Schmitt et al. 1994; West 1997). Fishing practices, coastal development, land-based chemical and nutrient pollution, energy practices, aquaculture, land use and land transformation, water use and shipping practices combine to alter the structure and functioning of marine and freshwater ecosystems globally (Lubchenco 1995). Foremost among the pressures facing Puget Sound and Georgia Basin is the region's continued population growth, with associated increases in development, tourism, and commercial activities placing increased demands and stresses upon the marine environment. Population in the Puget Sound region increased steadily and markedly between 1991 and 2000, growing by 576,000 (17 per cent) in the Puget Sound region. By 2020 the population is projected to exceed five million people (a further 29 per cent growth) in the Puget Sound region. (Georgia Basin Ecosystem Initiative 2003).

During an initial inventory of marine protected areas (MPAs) in Washington State, Murray (1998) found that only 1 of the sites provided harvest protection to all species. This reflects the fractured manner in which species are managed more than the lack of need to develop fully protected areas. More recently a state-wide inventory associated with the National Marine Protected Area center which defines marine protected areas as "*any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein*" (Executive Order 13158). This inventory has identified 74 sites managed by county, state or federal agencies that meet this standard (table 2). Thus, the existing patchwork of Washington marine protected areas represents a collection of sites, mostly small, which vary considerably in designation, manager, purpose, and degree of protection. No similar inventory has taken place for freshwater lake and river systems of Washington State.

The institutional mechanisms that have established these MPAs represent a complex, fragmented and often confusing mix of management policies, independent programs, legislative and administrative actions, and regulatory- and proprietary-based approaches. The Aquatic Reserves program will augment the protection of aquatic resources by adding sites to this de facto network. In addition, existing MPAs and protected areas may at times benefit from the protections offered through the Aquatic Reserves program. As a result of public confusion resulting from the range of protected area designations, WDNR and the Aquatic Reserves program will work cooperatively with other designation authorities to develop common language for describing protected areas to the public. The intent in doing this is to enhance public understanding, compliance and acceptance of Aquatic Reserves and other similar protected areas, without necessarily requiring changes to legal authorities. Existing efforts, such as the Marine Protected Areas working groups organized by the Puget Sound Water Quality Action Team, may provide opportunities for the various resource managers to work cooperatively on issues including site management and public communications.

Table 2: Marine Protected Areas in Washington State as Identified by MPA Center Inventory

Aquatic Reserves (WDNR)
Cherry Point**
Cypress Island*
Fidalgo Bay**
Maury Island*
Middle Waterway**
Olympic View**
Biological Preserve (UW FHL)
San Juan County Marine Biological Preserve (also UW FHL)
Clallam County Sanctuary
Tongue Point Marine Life Sanctuary
Federal Threatened/Endangered Species Protected Area (NOAA)
Pacific Whiting Columbia River Salmon Conservation Zone
National Estuarine Research Reserves (NOAA and Ecology)
Padilla Bay National Estuarine Research Reserve
National Marine Sanctuary (NOAA)
Olympic Coast National Marine Sanctuary
National Park (NPS)
Olympic National Park
San Juan Island National Historical Park
National Wildlife Refuge (USFWS)
Copalis National Wildlife Refuge
Dungeness National Wildlife Refuge
Flattery Rocks National Wildlife Refuge
Grays Harbor National Wildlife Refuge
Lewis and Clark National Wildlife Refuge
Nisqually National Wildlife Refuge
Protection Island National Wildlife Refuge (including the Zella M. Schultz Seabird Sanctuary managed by WDFW)
Quillayute Needles National Wildlife Refuge
San Juan Islands National Wildlife Refuge
Willapa National Wildlife Refuge
Natural Area Preserves (WDNR)
Bone River
Chehalis River Surge Plain
Dabob Bay
Goose Island
Gunpowder Island
Kennedy Creek
Niawiakum River
North Bay
Sand Island
Skookum Inlet
Whitcomb Flats

Natural Resource Conservation Areas (WDNR)
Elk River
Woodard Bay
Marine Preserves & Conservation Areas (WDFW)
Admiralty Head Marine Preserve
Argyle Lagoon, San Juan Island Marine Preserve
Bracketts Landing Shoreline Sanctuary Conservation Area
City of Des Moines Park Conservation Area
Colvos Passage Marine Preserve
False Bay, San Juan Island Marine Preserve
Friday Harbor-to-Point Caution, San Juan Island Marine Preserve
Keystone Conservation Area
Octopus Hole Conservation Area
Orchard Rocks Conservation Area
Saltar's Point Beach Conservation Area
Shaw Island, San Juan Island Marine Preserve
South 239th Street Park Conservation Area
Sund Rock Conservation Area
Titlow Beach Marine Preserve
Waketickeh Creek Conservation Area
Yellow and Low Islands, San Juan Island Marine Preserve
Zee's Reef Marine Preserve
Special Management Fishery Areas (WDFW)
Haro Strait
San Juan Channel & Upright Channel
Underwater Marine Parks (WSP&RC)
Blake Island
Deception Pass
Fort Casey
Fort Ward
Fort Worden
Kopachuck
Saltwater
Tolmie
Voluntary No-take Bottomfish Recovery Areas (San Juan County)
Bare Island
Bell Island
Charles Island
Gull Rock
Kellett Bluff
Lawrence Point
Lime Kiln Lighthouse
Pile Point
Wildlife Areas (WDFW)
South Puget Sound

* Provisional Aquatic Reserve, status pending review
** Withdrawn from leasing to become Aquatic Reserve, status pending review

Identifying New Aquatic Reserves

The Aquatic Reserves Program has developed out of recognition for the increasing need for place-based conservation management by WDNR. Following the evaluation of the existing sites using the criteria described below, WDNR will solicit recommendations or proposals for additional sites to be considered for Aquatic Reserve status. The process for evaluating reserves is outlined in the FEIS and will proceed from proposal through aquatic reserve status following the procedure outlined in figure 3. While sites will be evaluated following a proposal process, the intent of this program is to develop an ecologically sound network of reserves that function to achieve the aforementioned goals and objectives.

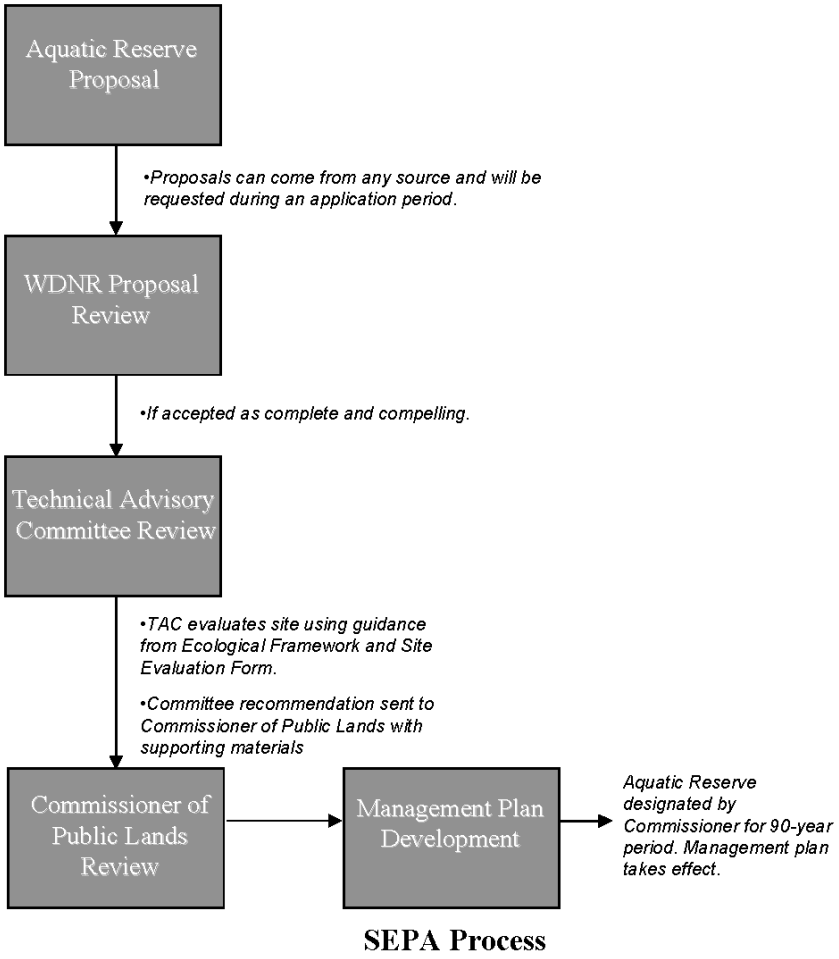


Figure 3: Overview of site evaluation procedure as outlined in FEIS.

To facilitate the development of an efficient, effective network of reserves, WDNR seeks to create a long-term, strategic conservation plan that will identify areas of importance for aquatic ecosystem function. This planning effort will be an important source of proposals to complement existing reserves. Such a planning framework will borrow components from the Natural Heritage methodology that was developed by The Nature Conservancy and is shared by a network of programs in all 50 states. This methodology uses a coarse filter/fine filter approach to target resources for conservation. Coarse filters targets are ecosystems while fine filter targets are specific species or communities that are identified as high priorities for protection. It is believed that an

efficient coarse filter approach to conserving biodiversity could protect representations of 85-90% of all species. A complementary fine filter approach focused on conserving individual rare or specialized species that slip through the coarse filter and are not necessarily protected in the reserves (Noss 1987). While such planning efforts are useful, their utility is limited by: insufficient natural resource distribution and abundance data, time and condition sensitivity of data, lack of complete interchangeability among sites that are in the same coarse filter or fine filter category, difficulties addressing connectivity among sites, and inadequate understating of the relative importance of coarse filter or fine filter components to overall ecosystem function. The Nature Conservancy has initiated such a conservation planning effort for parts of Washington State as part of their Ecoregional Planning Initiative. WDNR is committed to continuing to support and improve regional conservation planning by contributing to the collection and organization of natural resource data and the continued development of scientific understanding of aquatic resources and their conservation needs.

Critical to the success of this program is the application of science towards providing guidelines to achieve conservation goals for Aquatic Reserves, including protocols for reserve size, location, and network design, efficacy with respect to relevant local threats; and monitoring of goal attainment (Boersma and Parrish 1999). In reviewing the overall goal and components, note that WDNR's primary role in resource management is as a proprietary landowner and habitat manager. Species centric goals reflect the agencies interest in working cooperatively with agencies' whose core responsibilities include fishery management and species protection, water quality management and development permitting.

Several authors have developed qualitative criteria and rules for reserve selection (e.g., Hockey and Branch 1997, Leslie et al. 2003, Roberts et al. 2003a, b). Unfortunately such criteria are often based on theoretical underpinnings that are difficult to accurately capture and require data that is often scarce or absent for evaluation. Further insights into appropriate reserve design can be borrowed from recent attempts to evaluate existing protected areas (e.g., Alder et al. 2002, Done and Reichelt 1998, Done 1995). By examining past successes in place-based conservation, the Aquatic Reserve Program can help ensure that reserves status is applied when it is the most appropriate management tool.

More pragmatic and local criteria can be drawn from several efforts to strategically identify conservation needs in Washington State. Dyrness et al. (1975) set a goal of protecting representative habitats in natural condition, with special emphasis on capturing exposed shorelines, ocean-front cliffs and offshore islands, and areas that extend from high marsh through the intertidal as well as areas that include terrestrial components. A larger number of freshwater habitat types were identified as targets, however in 1975, only 12 of 78 freshwater habitat types were represented in the protected area network. A similar planning framework underlies recent ecoregional planning efforts undertaken by The Nature Conservancy. While appealing for its relative simplicity, targeting representative habitats as a primary goal provides a deceptively simple matrix for identifying and evaluating sites that neglects many of the ecosystem functions (e.g., sediment supply, hydrology, nutrient cycling, habitat connectivity, etc.) that created and maintain a site and interactions between sites.

Dethier (1989) proposed a more rigorous series of evaluation criteria for use in identifying areas for consideration as marine preserves. These criteria include: diversity within sites, plant and animal

biomass, presence of rare species or areas critical for rare species, pristineness, degree of water pollution, defensibility and protection potential, ability of larvae or propagules to access sites, degree of threat to a site, and a series of site functional values. Many reserve design criteria are theoretical in nature and their application to practical conservation challenges may prove difficult.

In generating criteria for evaluating reserve proposals we must be aware of the potential mismatch between the complexity of criteria and the high degree of uncertainty inherent in research (Walters 1998). By scoring most site attributes on a 3- or 4-point ranked scale our intention is to provide an evaluation tool that makes it relatively easy both to obtain a value in the absence of precise surveys and interviews, and for a group of experts to agree on a score (e.g., Pitcher and Preikshot 2001). Our intent is to avoid unnecessarily precluding the application of these criteria to site evaluations due to insufficient information. While we may never have enough scientific information (Sloan 2002), Aquatic Reserves will be evaluated using the best available scientific information and judgment. Additionally, traditional knowledge accrued by users of marine resources may provide a substantial portion of our initial understanding of a particular site and its role in the ecosystem (Agardy 2000).

Site Evaluation Criteria

Here we delineate a strategy and ecological basis for evaluating Aquatic Reserve proposals that ensures reserve selection and management is based on the best available science. This document provides the underlying ecological basis and justification for criteria contained in the Aquatic Reserve Site Evaluation Form. The FEIS identifies designation criteria that will be used to evaluate sites for Aquatic Reserve status (3.2.1.3.4). Indicators that contribute to our ability to evaluate sites using such criteria share five characteristics. They are: measurable, precise, consistent, sensitive and simple (Margoluis and Salafsky 1998). In using indicators, the target is the achievement of the stated Aquatic Reserve goals and objectives. The size, shape, and means of implementation in any single marine protected area will be a function of the primary objectives that it sets out to achieve (Agardy 2000). Below is a description of ecological, socio-economic and manageability indicators as well as indicators that will be applied specifically for research or education reserves. An ongoing area of concern in evaluating sites for reserve status is the inherent descriptive bias resulting from well-studied taxa including marine mammals, birds and plants (McKinney 1999) as well as extensively studied areas (e.g., San Juan Island).

As with other ecological questions, in designing reserves it is critical that the scale be appropriate to the question being addressed. Since different regional conservation targets operate at distinctly different scales, we must incorporate hierarchical thinking into plans for a regional reserve network (O'Neill et al. 1986). In planning for a reserve system to provide environmental protection, we will consider ecological characteristics at four overlapping scales: individual, population, community, and ecosystem/landscape. Each of these scales is examined using the criteria delineated in the FEIS.

The landscape scale provides an underlying structure for conservation planning. This scale can be effectively defined through the development and application of aquatic biogeographic regions. These regions differ from ecoregions (e.g., Omernik 1987, Bailey 1976). Research suggests that terrestrial ecoregions fail to capture patterns of aquatic biodiversity (Abell et al. 2002). The main ecological unit of freshwater systems is the catchment, also known as a watershed or drainage basin (Lotspeich 1980). Due to differences in the function and characteristics of freshwater and marine aquatic systems, different methods are applied to identify biogeographic regions. For freshwater

systems the classification system used for identifying management regions is that of hydraulic units known as hydraulic sub-regions. Hydraulic sub-regions include the area drained by a river system, a reach of a river and its tributaries in that reach, a closed basin(s), or a group of streams forming a coastal drainage area (Seaber et al. 1987). There are 222 sub-regions in the United States and sub-regions can include one or several individual watersheds depending on local and regional topography. A total of eight sub-regions are found in Washington State with several hydraulic sub-regions extending beyond Washington State's borders (figure 4). Hydraulic sub-regions are based on watershed characteristics making them an appropriate biogeographic region for conservation planning in aquatic systems.

Additionally, many local and regional conservation and restoration efforts are currently organized around watershed planning units that are ultimately based upon and nest within the hydraulic sub-regions described here.

At the landscape scale Washington's marine ecosystems are defined primarily by influences and mixing of fresh and salt water. Three primary marine regions in Washington are identified by oceanographic and species observations. The first is the Columbia River Littoral Cell, a region extending from the Columbia River estuary northward until North Beach, encompassing approximately half of the outer Washington State coastline (Peterson et al. 1991). The Columbia River littoral cell includes several sub-regions: Willapa Bay, Grays Harbor and the Columbia River estuary all of which received much of their sandy sediment from the Columbia river are part of this littoral cell. Each of these bays has an apparent mouth that was used to define their seaward extent. Seaward of the mouth of these bays oceanographic mixing overwhelms the influence of these bays. The second region extends from North Beach northward to the entrance of Neah Bay. This region is largely influenced by the Pacific Ocean with no large freshwater influences. The third region is the inland sea of Washington, extending from Neah Bay eastward. There are a total of 9 sub-basins identified for the inland sea waterbody. These sub-basins are based largely upon Ebbesmeyer et al. (1984) and are defined primarily by oceanographic zones with the boundaries defined by oceanographic sills. However, some demarcations are arbitrary with no clear physiographic basis. These sub-basins were originally developed primarily for the purpose of having a common reporting template for monitoring results at a sub-basin scale (PSWQAT 2002). These sub-regions within the Puget Sound region include the West Strait of Juan de Fuca, the East Strait of Juan de Fuca, San Juan Archipelago, Strait of Georgia, Whidbey Basin, Admiralty Inlet, Hood Canal, Central Puget Sound, and South Puget Sound (figure 5). The Aquatic Reserves program will seek to conserve aquatic resources across both marine and freshwater regions.

Figure 4: Freshwater biogeographic regions of Washington State

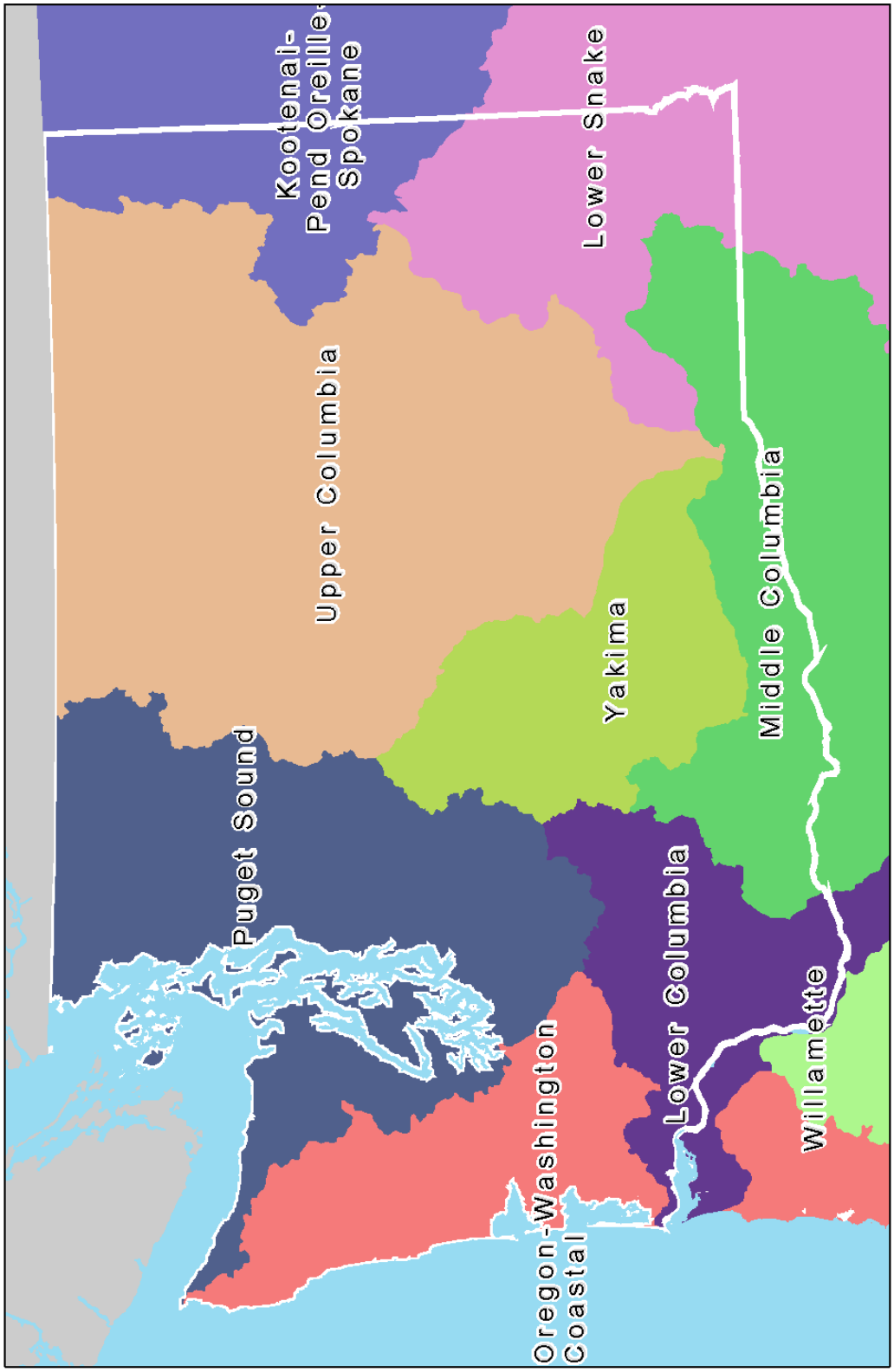
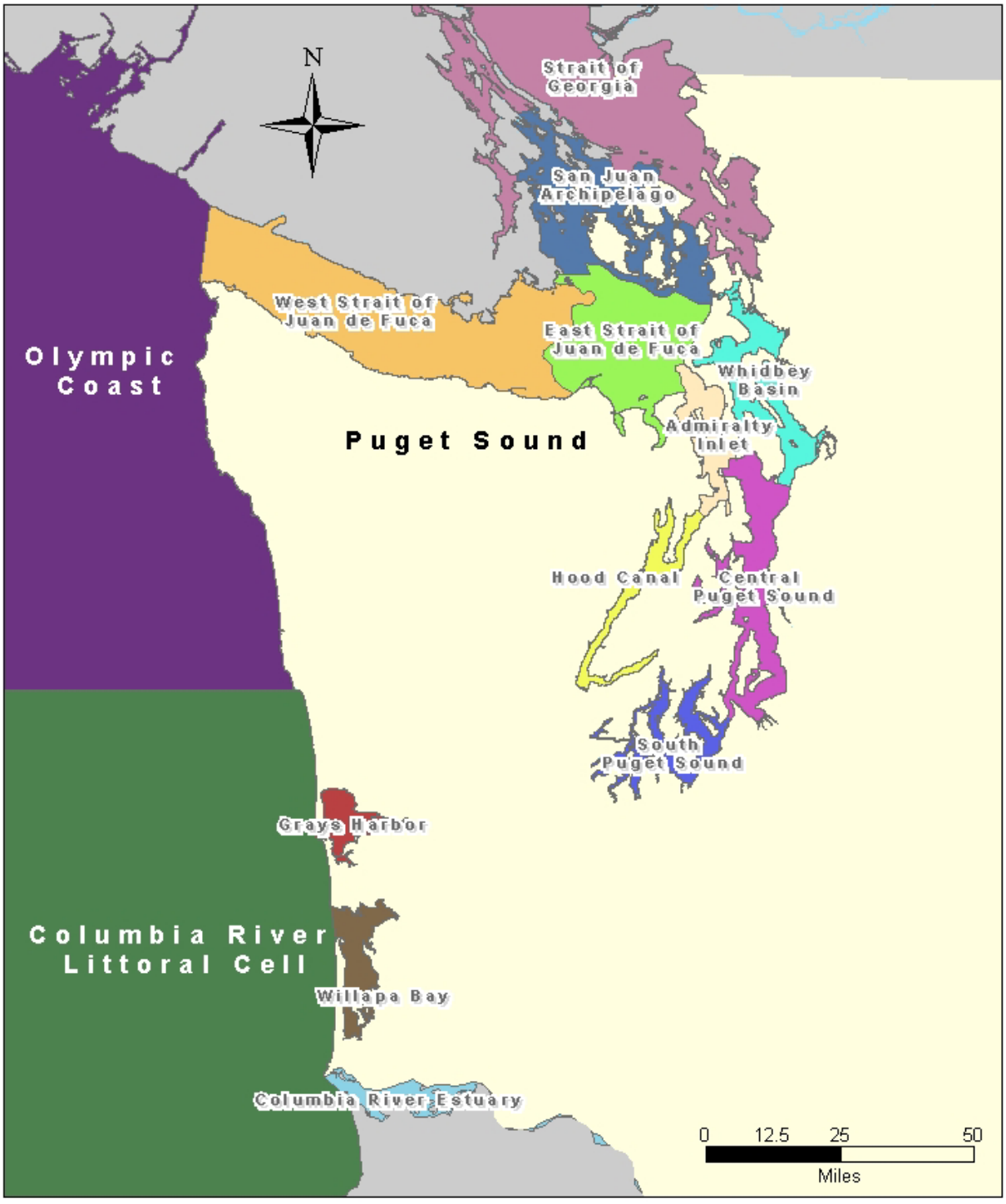


Figure 5: Marine biogeographic regions of Washington State



Ecological Quality Criteria

The overall intent of the following series of criteria is to capture sites that exhibit high ecological quality and will enhance the management of aquatic resources towards the Aquatic Reserve Program goals.

Site Condition

Since very few areas have avoided direct human influence and degradation (Vitousek et al. 1997), we lack the fundamental understanding of what the natural condition for many areas actually looks like. Therefore, it is important to act upon conservation opportunities using the precautionary approach until our understanding of these areas develops (Sloan 2002). Applying the precautionary principle to reserve design suggests that sites that are fully functional and in a relatively pristine condition are more predictable in their behavior and more resilient to minor insults than heavily degraded sites. Thus, among equivalent sites the more pristine site should be selected. However, this program is developed in part to aid the restoration of important aquatic habitats and it is recognized that the program will likely apply to sites that are undergoing intensive restoration. Where proposed reserves include a substantial restoration plan, the plan should be included as an addendum to the proposal.

Biogeographic Representation

Coverage of all biogeographic regions is a prerequisite for protection of biodiversity because assemblages of species will vary by biogeographic region (Ballantine 1997). Sites in different biogeographical zones cannot be compared directly, and it is important that reserves are sited within each (Rebelo & Sigfried, 1992; Turpie & Crowe, 1994) Therefore, the Aquatic Reserve Program will use the aquatic biogeographic regions to distribute conservation effort and to ensure protection of habitats across the diversity of aquatic habitats found in Washington State.

Habitat Representation

Marine and estuarine habitat will be classified according to Dethier (1990) or similar habitat classification system. Many marine shoreline resources have been inventoried using the ShoreZone classification method (Berry 2000), a method that is compatible with Dethier (1990). Until such efforts are undertaken for freshwater habitats, WDNR will rely on the Cowardin et al. (1979) classification system. This system distinguishes major systems by a variety of hydrologic, geomorphologic, chemical and biological characteristics. An overview of the habitat classes is provided in figures 6 and 7 for riverine and lacustrine systems.

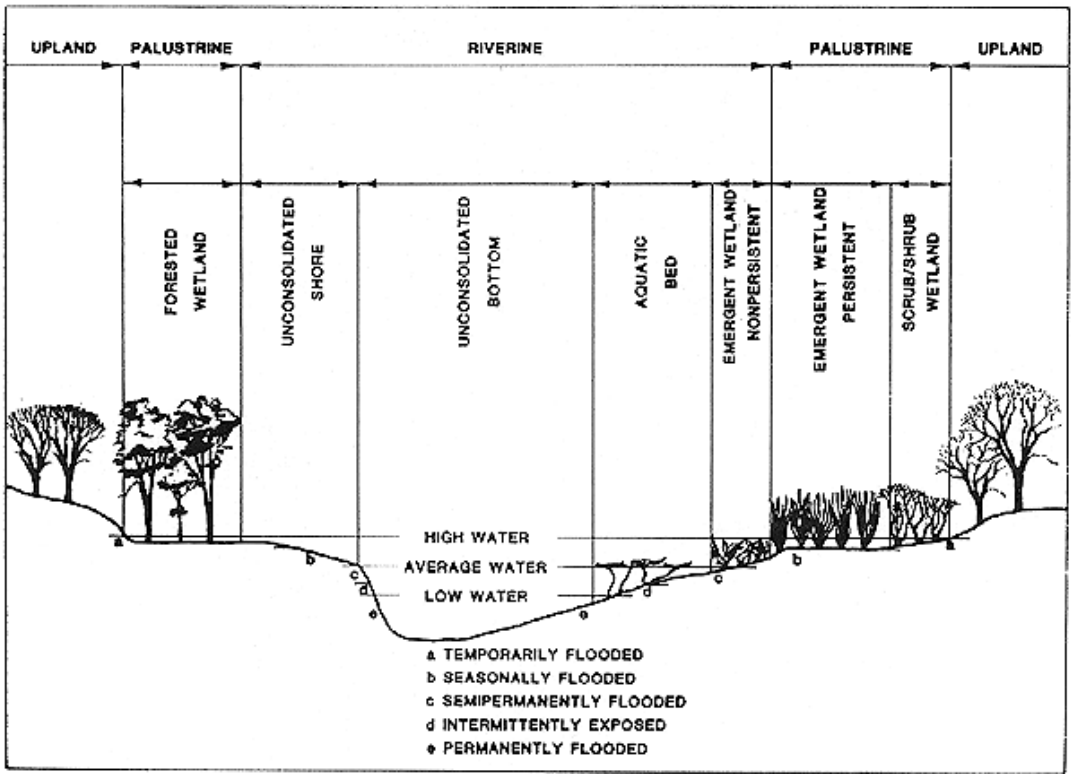


Figure 6: Distinguishing features and examples of habitats in Riverine Systems.

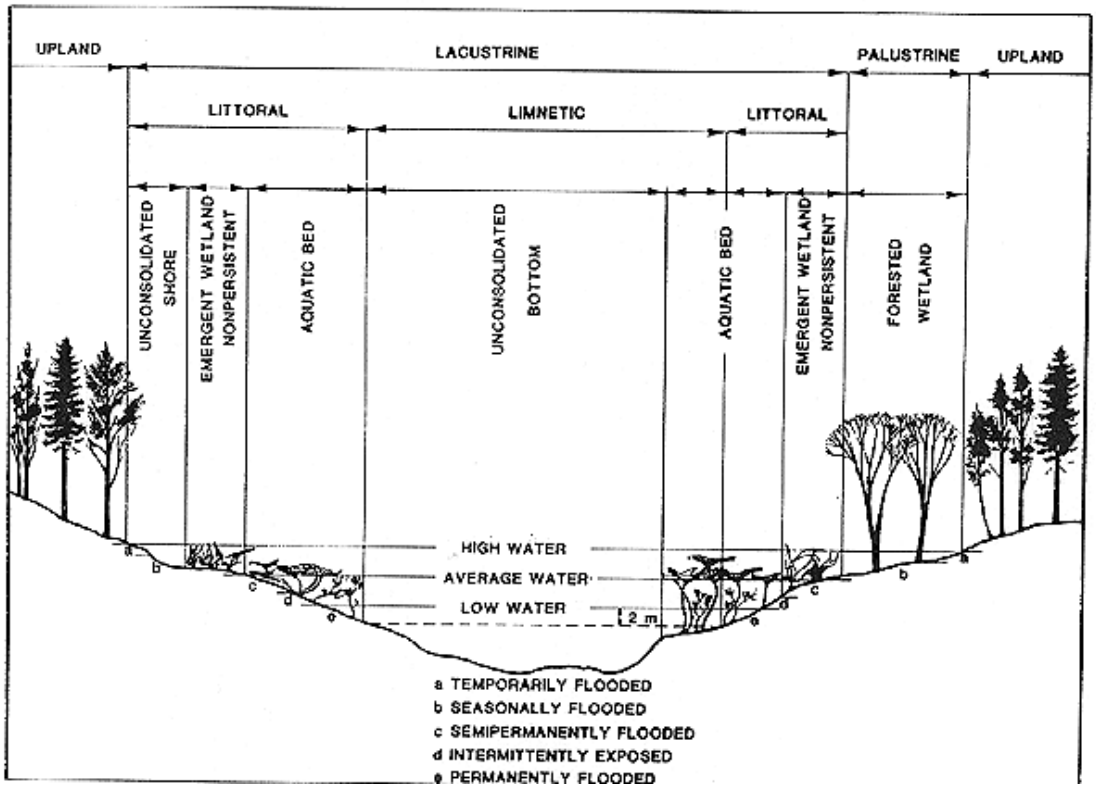


Figure 7: Distinguishing features and examples of habitats in Lacustrine Systems.

In the future, the Aquatic Reserve Program would benefit from the collection of data following the hierarchical classification framework for freshwater ecosystems developed by The Nature Conservancy that describes and predicts biological community diversity and distribution (Lammert et al. 1997). The classification framework characterizes aquatic ecosystems in abiotic and biotic terms (Figure 8 and Table 3). Biological communities are described at two levels of organization: alliance and association. The biotic classification units are nested within four spatially hierarchical abiotic levels. From the coarsest to the finest in scale, these are: ecoregional province, ecoregional section, macrohabitat type, and habitat unit type. The abiotic classification provides a standard way to describe the range of physical settings associated with each biological community type and to characterize ecological units that contain potentially distinct community types (Angermeier and Schlosser 1995).

Table 3: Definitions and key variables for each classification framework level.

Level	Description	Key Variables
Ecoregional Province	Large areas of similar climate corresponding to a broad vegetation region.	Climate General physiognomy of the vegetation
Ecoregional Section	Areas of similar physiography within Ecoregional Provinces.	Landform Geology
Macrohabitat Type	Types of small to medium-sized lakes or lake basins, and valley segment types of streams. Note: lentic, lotic, and nearshore ecosystems are treated separately.	Surficial geology Local physiography Size, shape, and network position
Habitat Unit Type	Distinct subunits of macrohabitats that capture the physical variability.	Depth and light penetration Velocity (lotic) Substrate
Alliance	Coarse level of biological community organization. Corresponds spatially to macrohabitats.	Taxa that are diagnostic of groups of associations
Association	Finest scale of biological classification. Corresponds spatially to either macrohabitats or habitat units.	Repeating, distinct species assemblages

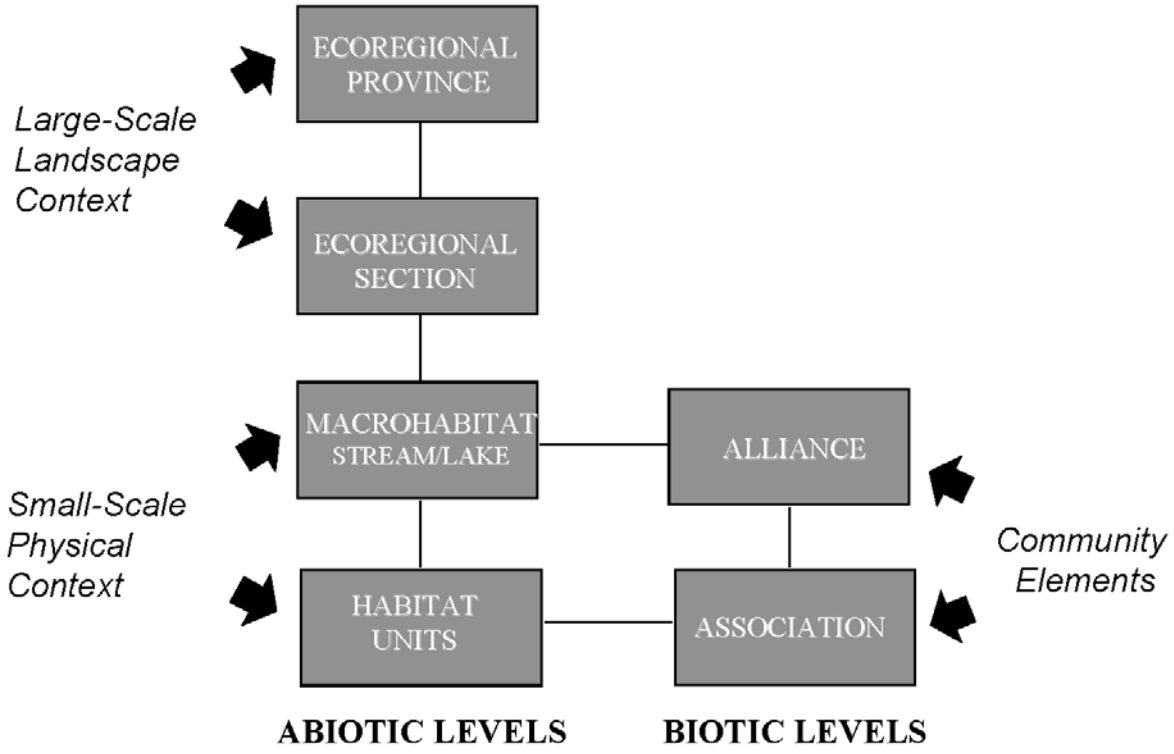


Figure 8: The Nature Conservancy's aquatic community classification framework.

The quantities of each type of habitat will be assessed for their historic relative abundance within each biogeographic region, and a running tally of habitats in protected status will be established. Reserves will seek to protect the majority of habitats at a level proportional to their abundance in a given biogeographic region. Particularly sensitive, important or diminished habitats will be specific targets and will likely be over-represented in the reserve network when compared to the current distribution and abundance of habitats. Man-made, artificial or altered habitats will not be the direct target of conservation efforts, however they may be included in Aquatic Reserves as restoration areas or to conserve relict portions of the ecosystem. Habitat protection serves as a proxy for non-target species conservation. For areas of a given size, as the number of sustainable habitats found within a reserve site increases, so does the value of the site as a reserve. Increased habitat heterogeneity improves the ability of reserves to meet the overall reserve objectives of protecting representative amounts of natural habitat. Furthermore, reserves that protect many types of habitat are more likely to support multiple life stages (Appeldoorn et al. 1997).

Biodiversity within site

Sites with the highest biodiversity per unit area provide a mechanism for conserving a maximal amount of our aquatic natural heritage. A danger in focusing protection effort on areas with high observed biodiversity is that areas with intermediate habitat quality are known to frequently harbor high species richness, but are dominated by cosmopolitan or invasive species (Rapoport et al. 1986). In identifying areas of high biodiversity we must also account for 1) the natural increase in biodiversity associated with larger areas due to species-area effects and 2) natural differences in

biodiversity between biogeographic regions. Plant and animal biomass often represent good proxies for overall site biodiversity.

Applying the concepts of alpha, beta and gamma diversity (Whittaker 1960, 1977) to reserve planning in the aquatic environment, marine regions exhibit low beta diversity, meaning the differences in species composition between distant locales are relatively low. The implication is that representative examples of most species could be captured in a relatively small number of large reserves. However, since many aquatic species are highly mobile and have different habitat requirements at different life stages, issues of habitat connectivity will be instrumental for successful reserve network design. Freshwater habitats exhibit considerably higher beta diversity with large species composition differences between various river and lake systems. Therefore, in the freshwater system we might expect to develop a system of reserves that contain a larger number of smaller reserves in order to capture viable examples of most species and habitat types found in Washington State.

Size

Providing clear guidance relating to reserve size is difficult because of the trade-offs associated with increasing reserve size. There is no single size, no single scheme of management, no single means of protection that is universally applicable to all conservation reserves. The appropriate size, the appropriate management scheme, and the appropriate means of protection depend on the purpose for which the reserve was established. Ecologically, larger and more numerous connected reserves tend to be beneficial for preserving species diversity because reserves often act like habitat islands in a sea of habitat destruction (e.g., Diamond 1975, Simberloff and Abele 1976). Research in marine habitats suggests the preservation of discrete fragments of habitat within larger areas may provide significant conservation benefits. (McNeill and Fairweather 1993). Social, political and economic forces tend to push for smaller, and less numerous reserves which are highly dispersed. An important goal for all reserves is that they be of sufficient size to provide for internal recolonization of species in response to natural disturbances (Pickett and Thompson 1978).

Models suggest that highly mobile species decrease the effective size of reserves (Boersma and Parrish 1999). Thus, reserves targeting species that are more mobile should be larger than those focused on the protection of sedentary or sessile organisms. Addressing the minimum size a reserve must be is difficult and will vary depending on the specific species or habitats the reserve is designed to protect or enhance. The intent is to establish sites that are large enough so plant and animal populations are self-supporting. Larval studies suggest that sites less than 1 square kilometer in size are likely to export most larval production, and therefore are unlikely to receive recruitment benefits as a result of protection (Kinlan and Gaines 2003). When possible sites should capture the range of habitats used by animals throughout their lives. This program is likely best suited for sites that are hundreds or thousands of acres in size. Sites smaller than this range will likely require intensive management to maintain features of interest, thereby raising management costs while generating uncertain outcomes. Small sites may include those established primarily to restore habitats and ecosystem processes as well as some freshwater sites where a small site may encompass most or all of the aquatic system.

Increasing reserve size increases the likelihood that the reserve network can capture and sustain entire ecosystem components. In general, reserves should be large enough to capture entire habitats

of interest, including eelgrass beds, kelp beds, salt marshes, or other aquatic habitats. Additionally, when possible, reserve sites should include buffers surrounding species and habitats of interest to provide for seasonal and inter-annual expansions and contraction.

Viability

Populations of large animals found within Aquatic Reserve sites are unlikely to be viable in isolation. However, wherever possible the reserve sites will contain viable populations that are large enough to maintain populations despite stochastic effects. When protecting sufficient habitat in a single reserve is not possible, protecting many habitat patches may enhance the viability of populations (Roberts 2000). Therefore, the Aquatic Reserves program will seek proportionately more representations of habitats used by larger, more mobile target species.

A basic tenet of reserve design is that targets should be protected in multiple different reserves (Ballantine 1997). In developing the Aquatic Reserve Program, WDNR recognizes the important role of regulatory and proprietary protection for aquatic resources. Multiple representation is particular important in aquatic systems because they are naturally dynamic and prone to pulses of rapid change. Severe storms, floods, species invasions, and disease are among the natural catastrophes that can be expected to impact many Aquatic Reserves. Natural catastrophes tend to be unpredictable, and occur at time and spatial scales that are beyond the scope of this program's management. Reserve sites may be adversely affected by natural disturbances that are prolonged, extreme, rapid or infrequent (Roberts et al. 2003a). To mitigate for these potential impacts, sites should be large enough for internal replenishment. However, to avoid unintended consequences of natural catastrophes, it also is important to protect focal species and habitats in multiple, spatially disjunct, but ecologically connected reserves.

Connectivity

One of the major ecological premises underlying this program is the intrinsic linkage between terrestrial and aquatic (both freshwater and marine) realms, in addition to linkages among aquatic realms. The implication of linkage between terrestrial and aquatic habitats is that conserving aquatic resources requires consideration of shorelines and upland areas (Salm and Clark 2000). Ecological connectivity among reserves is an important consideration for supporting biodiversity both within and beyond Aquatic Reserves. Types of connectivity may include: 1) the exchange of offspring, 2) the movement of juveniles, and 3) the transfer of materials such as organic carbon (Roberts et al. 2003a). Individual sites managed through this program are unlikely to protect sufficient territory to fully capture the range of habitats used by most individual species throughout their lifetime. Cetaceans, salmonids and pinnipeds are likely to spend a small portion of their lifetimes in any one reserve. However, the reserve network should support the ecological processes, habitats and species that ultimately support the long-term survival of these species. Additionally, Aquatic Reserves can directly support the long-term survival of these species by protecting areas used by these species during sensitive life stages, such as haul-out areas and spawning beaches.

Variability in ocean currents, spawning seasons, larval life histories, and dispersal distances (from meters to hundreds of kilometers) makes it virtually impossible to obtain a single value to measure connectivity between sites for all taxonomic groups (Sala et al. 2002). Studies examining marine larval dispersal have identified at least two scales – distances of less than 1 and greater 20 kilometers - at which reserves should be positioned relative to each other to support the dispersal of

aquatic larvae among reserves (Grantham et al. 2003). While recent studies have suggested that larvae may be traveling shorter distances than initially thought (Kinlan and Gaines 2003), reserves less than 1 square km in size are likely to support internal colonization for a limited portion of the ecosystem – primarily algae and some invertebrates. Most fish and many invertebrates are believed to disperse more than 10 km with a mean dispersal distance for fish species of approximately 100 km (figure 9; Kinlan and Gaines 2003). These taxonomic differences in dispersal emphasize the need to examine connectivity at multiple scales to adequately support metapopulation dynamics of aquatic species.

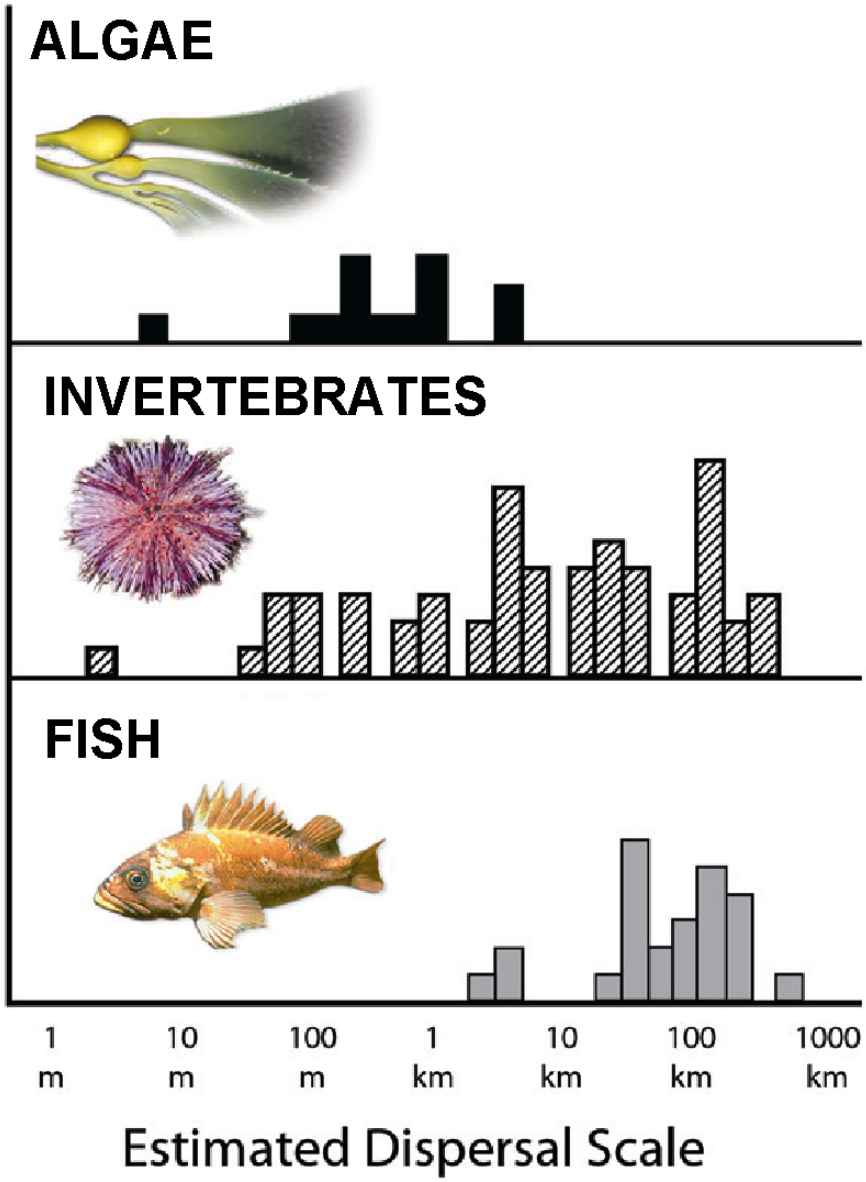


Figure 9: Estimated dispersal of algae, invertebrate and fish (adapted from Kinlan and Gaines 2003)

Species of Special Concern

Species of special concern include threatened, endangered and sensitive species as recognized by the state or federal governments. Species receiving similar designations by the provincial government in British Columbia or the federal government in Canada will also be considered. However, these lists are known to have taxonomic bias (Tear et al. 1995) and the listing or lack of a species on these lists may be primarily a reflection of the understanding of a given species. Therefore, this document provides additional guidance for the inclusion of species that may not yet be officially listed as conservation targets. WDNR will consider any species or subspecies identified through population viability analysis (e.g., Lande 1988) to have a 90% or greater probability of extirpation from Washington State over a 100 year planning horizon to be a species of special concern, regardless of its formal listing status. Additionally, any species found to have declined in abundance by 90% or more from historic levels within their Washington range will be considered a species of special concern.

Unfortunately, population and distribution information is rarely kept for species that are not the targets of harvest fisheries. The Aquatic Reserve Program will work with other partners to further develop the capacity to collect and store species observations of abundance and distribution.

This program seeks to protect representations of all major aquatic habitats found in Washington State. However, a few specific types of habitat will receive special attention with this program, including habitats that are rare, support high primary productivity, or are known to support large numbers of animals – particularly during predictable aggregations. In addition this program recognizes that habitats often occur in a range of successional stages, and this program will attempt to support that range of successional stages.

Vulnerable Habitats, Life Stages or Populations

A central role of the Aquatic Reserve Program is protecting those habitats that are used by species during vulnerable life stages. Vulnerable life stages include periods of natural aggregation such as during spawning or breeding as well as haul-out areas. River and stream mouths are especially sensitive areas for a number of reasons. First, species often ‘hold’ in the vicinity of stream and river mouths both before they enter the freshwater from the marine environment and as they leave the freshwater for marine waters. This ‘holding’ is often essential to the physiological adjustment necessary to transition from fresh to saltwater or vice versa. River and stream mouths also deliver nutrients to the marine environment leading to the development of relatively rare habitats that thrive in this high nutrient environment.

Ecosystem Processes

Important biological processes that should be captured within the Aquatic Reserve network include spawning areas, migratory pathways, feeding areas, settlement and concentrated feeding areas. Natural disturbance regimes such as seasonal flooding and tidal action sustain the structure and functions of regional aquatic ecosystems. Dynamic and sometimes destructive forces play an important role in structuring biological communities and habitats (e.g., Paine 1969). The natural organization of aquatic ecosystems, and particularly wetlands, is strongly influenced by dynamic disturbance regimes (White and Pickett 1985).

Unlike terrestrial ecosystems where ecological structure is strongly dominated by trophic interactions, the organization of aquatic ecosystems is strongly mediated by physicochemical and other environmental factors. Factors such as river flow, sediment re-suspension and circulation features alter the scope and intensity of responses to both bottom-up (e.g., Boynton and Kemp 2000) or top-down (e.g., Alpine and Cloern 1992) controls on community and food web structure and production. Therefore, the Aquatic Reserve Program will target the maintenance of physicochemical processes because of their essential role in sustaining aquatic ecosystems.

Socioeconomic Criteria

When balancing the environmental, educational or scientific benefits of Aquatic Reserve designation against the actual or perceived economic costs, "we are often left trying to balance the 'good' of ethics with the `goods' of economics" (Morowitz 1991). Beyond the difficulties assigning economic values to environmental features and services, it is often necessary to contrast what is financially beneficial to private individuals against what is broadly beneficial to society as a whole. Protected areas have a valuable economic characteristic—most of the benefits of a protected area can be "consumed" by one person without affecting the ability of another person to also benefit from the protected area (Munasinghe and McNeely 1992).

Cultural Resources

Washington has a rich cultural history, a history that has been lost, degraded and damaged by time, changes in climate, and ignorance. Cultural resources include a range of different resource types. These resources include locations containing archaeological and architectural remains resulting from human activity in the prehistoric and historic periods; and locations of continued traditional use activities, primarily associated with areas of religious or traditional subsistence concern to Native Americans. While reserves will be examined primarily for their environmental attributes, reserve designation may be influenced by the presence of sensitive cultural artifacts or current uses. Through protection and management of reserves WDNR will promote a greater knowledge base and understanding of cultural resources, tribal cultural practices, and significance of archaeological sites, and places names. By preserving and managing cultural resources in a sustainable manner, future generations may share in the understanding of regional archaeological and cultural sites. Furthermore, protection may provide opportunities for individuals and groups to continue to engage in culturally important practices. Historic artifacts such as historic fishing villages or clam middens are potential indicators of the long-term importance of a site for environmental and well as cultural purposes. By identifying and protecting cultural artifacts we may also be providing opportunities for study and exploration of historical interactions between society and the environment.

Public Benefit

Living marine resources provide essential economic, environmental, aesthetic, and cultural benefits to humanity. In some cases the reserve program will arbitrate alternative uses of a site. The management of aquatic lands is intended to "provide a balance of public benefits for all citizens of the state" (RCW 79.90.450). This balancing will require WDNR to consider economic, environmental, aesthetic and cultural values associated with sites.

The economic value associated with a site includes direct use values, indirect use values, option values, and non-use values. Direct use values would include consumptive (e.g., fishery harvest or mineral extraction) as well as non-consumptive (e.g., tourism or SCUBA diving) uses. Indirect use

values are derived from the economic benefits associated with ecosystem services. Because ecosystem services are not fully 'captured' in commercial markets or directly comparable with economic services and manufactured capital, they are often given too little weight in policy decisions (Costanza et al. 1997). Option values relate to potential future utility of resources such as components of the ecosystem that might be useful sources of food or medical products in the future but are not currently utilized. Non-use values relate primarily to spiritual, cultural and aesthetic regard individuals and cultures hold for the natural environment. Aquatic systems have been a consistent source of inspiration: "The oceans, with their powerful storms, their shimmering palette of colors, and their varied mysterious sea life, have inspired some of the world's finest painting, poetry, stories, and music" (Norse 1993).

Ultimately, the burden of balancing the environmental benefits of reserve designation versus the economic benefits of alternative uses is left to Washington's Commissioner of Public Lands.

Manageability Criteria

The effectiveness of reserves as a mechanism for conservation is highly dependent on the quality of protection and management of the reserves (McNeely et al. 1994). To maximize the effectiveness of the Aquatic Reserve Program, sites must be manageable and have clear boundaries that are transparent to potential users. Ecologically sound biological boundaries are difficult to identify in many cases due to the dynamic and transient nature of many aquatic habitats and species. Therefore boundaries should tend to be ecologically conservative, capturing the target resources in addition to a buffer zone to account for unintentional encroachment on the reserve boundaries as well as uncertainty regarding biological behaviors.

Threats

The Aquatic Reserve Program is designed to protect specific areas from threats created by human behavior, consumption and development. Ecosystems integrate the impacts of all threats and reserve management must address these multidimensional threats that affect ecosystem health at multiple time and spatial scales. Threats may affect the viability of Aquatic Reserves and undermine its ability to contribute towards the attainment of the programmatic goals and objectives. Some present or future human disturbances can be effectively prevented through the establishment of an Aquatic Reserve. Threats will be identified and categorized according to the ability of the reserve program to effectively manage or eliminate the threats. The reserve program is best suited to management threats that exist and impact entirely within reserve boundaries, while threats whose impacts are separated by space or time are more difficult to manage.

One function of Aquatic Reserves is to provide the ecosystem with a buffer from the impacts of anthropogenic disturbances. A critical difference between natural and anthropogenic disturbances is that anthropogenic disturbances tend to be long term or permanent conversions of habitat.

Social/Political Acceptability

A lesson from other protected areas is that the active participation of stakeholders in the planning and management of protected areas can improve success of the protected area. Forcing local user groups to accept a protected area will create resentment and diminish the likelihood of compliance with voluntary, proprietary or regulatory management best practices. Therefore, the degree of local recognition for natural resource value at a site is an important barometer for reserve implementation

success. Therefore, the existence of public stakeholder organizations that voice support for reserve establishment is a valued pre-condition for Aquatic Reserve designation.

Development of Conservation Proposal

During the evaluation of a given proposal primary consideration will be given to the condition of the site and the environmental value of that site to the reserve network. However, conservation planning is a process and for some proposals the planning process will be more advanced than others. The FEIS outlines a number of criteria for evaluating sites that can more accurately be described as best management practices for Aquatic Reserve planning and development. Examples of such best management practices include: the coordination of conservation actions with other entities including jurisdictions and stakeholders; the development of relationships and roles for potential management partners; identification of enforcement needs for a given site; and the development of a clear monitoring plan to measure changes associated with reserve designation.

Scientific Research Criteria

Scientific Aquatic Reserves will primarily be developed as controls for scientific inquiry, with occasional opportunities for manipulation. For studies examining changes in species abundance, assemblage or behavior as a result of reserve designation, the 'effect' is not from removing threats and disturbance from an area; it is those areas that remain unprotected that are actually the manipulated areas. Research on scientific reserves may assist in the development of natural baseline population densities and assemblages. However, it is important to have flexibility in the application of scientific reserves such that manipulative research can be undertaken to improve our understanding of the natural system, such as enhancing or reducing competition among top predators. By enhancing our understanding of the functioning of the natural system we may endeavor to improve management of the majority of areas that remain in an unprotected status.

Amount of previous scientific work undertaken

One of the largest challenges for resource managers is the lack of adequate control areas to study the behavior of species, habitats and ecosystem processes in the absence of management. Aquatic Reserves should be areas that are designed to take advantage of these scientific opportunities. It is by furthering our understanding of natural processes that we might better manage the areas that continue to fall outside the boundaries of Aquatic Reserves. Of particular value is the development of long-term ecological research studies and monitoring stations that include Aquatic Reserves.

Presence of current research projects

For many locations reserve designation provides a change in management for a given location from unprotected status to protected status. A failure of many monitoring efforts is to adequately capture and describe the pre-protection condition to document the impacts of management on biological communities and habitats. Therefore, sites that have a long or detailed history of scientific research projects and would benefit from reserve application will be favored during reserve selection.

Regularity of survey or monitoring work done

Due to the importance of appropriate monitoring in supporting adaptive management, and in recognition of the high cost associated with such activities, this program will seek to identify sites which can be monitored, to the extent practicable, either a) remotely or b) using existing or multi-

use monitoring stations such as those developed through the Puget Sound Ambient Monitoring Program. Aquatic Reserve proposals failing to meet these conditions should propose methods for monitoring the effectiveness of the site.

Education Criteria

The development of an 'environmentally literate citizenry' is the primary goal of environmental education; and the acquisition of responsible environmental behavior has long been recognized as one of the ultimate goals of environmental education (Stapp, 1969; Roth, R., 1970; UNESCO, 1980; Roth, C., 1992). The active participation of the general public is a key factor in preventing and solving the environmental problems of contemporary society (UNESCO, 1978a, 1988).

Through the designation of Educational Reserves, the Aquatic Reserve Program will support the requirement for "instruction about conservation, natural resources and the environment" to be provided at all grade levels as required by state law (WAC 180-50-115). A recent survey of 709 K-12 schools in Washington identified access to field-based learning as one of the most important resources needed to improve student learning (Angell, personal communication). Many studies have indicated that experiences in the outdoors (and in particular experiences in natural areas) is the number one influence as to why people develop environmental sensitivity (James, 1993; Palmer, 1993; Tanner, 1980) and commitment to environmental protection (Chawla, 1999). In particular, outdoor experiences at an early age have positive long-term effects.

Educational Value

Aquatic Reserves provide a natural laboratory for exploration by students of all ages. There are several lessons that can be taught using such areas as natural laboratories for observational inquiry. Lessons may include exploration of the relationships between species and their habitats, species and other species as well as the impacts of disturbances and development on resources. Sites that have a history of use for educational purposes will be given priority over sites of similar ecological value. To maximize the value of these reserve sites, repositories for observational and natural history information should be developed.

Distribution of Sites

One function of Aquatic Reserves is to provide educational opportunities for adults and children. This requires that sites be accessible to people where they live. Therefore, an emphasis will be placed on distributing sites throughout the state. WDNR recognizes that other agencies and organizations provide environmental education opportunities throughout Washington. Therefore, the Aquatic Reserve Program will prioritize areas for protection that are underrepresented in the existing educational network. In addition to the location of other reserves, it is important to consider the types of habitat that are available for students of all ages to experience. Therefore, habitats that are not yet represented in the educational reserve network will be prioritized.

Ease of Access

A vital consideration for all reserves expected to serve as educational reserves is the amount and quality of access to the site. Access can be from the water or terrestrial areas adjacent to the site. Appropriate management measures such as the development of entry paths or boardwalks, mooring buoys or other measures that concentrate and direct use during site visits should be examined.

Application of Criteria

The selection of areas for conservation often involves the prioritization of potential reserve sites based on selection criteria (Wright 1977). However, few researchers agree on the relative importance of different criteria, complicating efforts to develop universally accepted methods (Margules & Usher, 1981). Evaluating sites using criteria scores is an artificial construct that can be misleading when evaluated in isolation. Therefore, drawing conclusions from site-specific scores is most valuable when placed in context and compared to a range of well-documented sites. Therefore, WDNR will develop site evaluations for several reference sites using the described criteria to provide appropriate context for site evaluations (e.g., Alder et al. 2002).

An evolving trend in reserve design is the use of iterative methods that capture goals more efficiently (e.g., using fewer sites and less total area) than do criteria based approaches (Pressey et al. 1993, Possingham et al. 2000). The Aquatic Reserve Program will take advantage of such iterative approaches by developing the reserve network over time. All goals and criteria are unlikely to be satisfied for any individual sites. Therefore, it is important that the program be flexible in the application of reserve criteria. Over time the program will adapt to prioritize criteria and goals that are being underachieved by the reserve network. Site evaluations will proceed such that sites will be evaluated using ecological criteria first. The program places the most emphasis on selecting those sites that have the highest ecological value. However, where two sites are of comparable value ecologically, then socioeconomic criteria should dominate the choice of which should be protected (Roberts et al. 2003a).

The Aquatic Reserve Technical Advisory Committee, an independent panel of scientists, will evaluate individual site proposals for Aquatic Reserve status. The criteria and specific indicators used to address each criterion are delineated on the Site Evaluation Form. Several of the criteria identified in the FEIS require the use of multiple indicators and questions. To avoid overvaluing one criterion versus another, scores will be normalized for the individual criterion identified in the FEIS. Environmental Reserve evaluation will rely entirely on the application of the overall designation criteria, while educational or scientific reserve proposals will be evaluated using additional criteria.

Management of Aquatic Reserves

These evaluations will be the primary information collected to determine whether sites should be designated as Aquatic Reserves. The protection of individual sites represents the beginning of information gathering and management, not the end-point as some would believe. The designation of a site as an Aquatic Reserve triggers some limited protection for the site by withdrawing the site from any potentially adverse leasing activity for a period of 90 years. It is important to note that designating a site as an Aquatic Reserve does not imply that commercial or other human activities are prohibited. Rather, its status is intended to ensure that human use is held at levels that are ecologically sustainable by restricting activities to those that are compatible with the reserve goals (FEIS 3.2.1.4.2). WDNR will also work with regional educational and research institutions to encourage the use of Aquatic Reserve sites for educational experiences and research projects. Additionally, the agency may develop educational and outreach materials regarding individual Aquatic Reserves, the ecological functions they support and best practices associated with those reserves.

However, the effectiveness of the Aquatic Reserves Program will depend, in part, on the successful partnership with state, Tribal and local resource managers and stakeholders in developing management plans for each individual site. Therefore, while the boundaries of Aquatic Reserves will be limited to areas under WDNR ownership, WDNR will work with adjacent landowners and regulators to extend protection beyond reserve boundaries. Additionally, the potential reach of management on all Aquatic Reserves will extend beyond reserve boundaries to include threats and ecosystem processes that impact the reserves.

Best Practices for Aquatic Reserve Evaluation

1) Use All Available Data

WDNR staff will make a concerted effort to work with site proponents to find all available relevant data for Aquatic Reserve Proposals prior to convening the Technical Advisory Committee to evaluate proposals. WDNR has committed to conducting a statewide inventory of the state's aquatic lands and resources (FEIS 3.2.1.3) that will be used to support Aquatic Reserve proposals in the future. Additionally, the Department will attempt to collect adequate information to determine whether it is successful in achieving the Aquatic Reserve Program's goals and objectives.

2) Cooperate with Managers and Stakeholders

The ability of WDNR to fully realize its goals and objectives is dependent on many factors outside of the Department's direct control. Therefore, the Department will work with partners including government agencies, Tribes, academic institutions, non-governmental organizations, individuals and stakeholders to select and manage Aquatic Reserves.

3) Criteria Update and Review

Criteria used to evaluate proposals will be reviewed and updated on an as needed basis as scientific information becomes available. The Technical Advisory Committee members will have the ability to interpret criteria using all available scientific information.

4) Adaptive Management

Protecting the best available site during each application cycle may fail to adequately achieve the Aquatic Reserve Program goals and objectives. Therefore, calls for Aquatic Reserve proposals will be guided, in part, by the success of the Aquatic Reserve Program in achieving its goals and objectives. Adaptive management concepts will also be applied to the management of individual Aquatic Reserves.

Glossary

Anthropogenic – caused or produced through the agency of humans

Benthic – living at, in, or associated with structures on the bottom of a body of water.

Biodiversity – The variety of organisms considered at all levels, from genetic variants belonging to the same species through arrays of species to arrays of genera, families and still higher taxonomic leves; includes the variety of ecosystems, which comprise both communities of organisms within particular habitats and the physical conditions where they live. Structural, functional and compositional diversity of organisms and their environments.

Biogeography - The spatial distribution of plants and animals, both past and present.

Degradation – the loss of native species and processes resulting from human activities such that only certain components of the original biodiversity still persist, often including significantly altered natural communities.

Distribution – occurrence, frequency of occurrence, position, or arrangement of animals and plants within an area

Indicator - Physical, chemical, biological or socioeconomic measures of particular attributes used to indicate state or condition.

Ecosystem - a community of organisms and their physical environment interacting as an ecological unit

Ecosystem functions – the biophysical processes that take place within an ecosystem. Examples include nutrient cycling and water purification.

Ecological process – processes that govern material, energy, or information transfer

Ecosystem integrity – The capability of supporting and maintaining a balanced, integrated, adaptive community of organisms having species composition, diversity, and functional organization comparable to that of the natural habitat of a region (Karr 1987).

Habitat – an environment of a particular kind, often used to describe the environmental requirements of a certain species or community.

Lacustrine – pertaining to lakes, reservoirs, wetlands or any standing water body of considerable size.

Marine – saltwater or living in saltwater

Manageable – An anthropogenic or natural event, action, structure, or characteristic that can be affected by regulation or proprietary actions.

Nearshore – the estuarine/delta and marine shoreline and areas of shallow water from the top of the coastal bank or bluffs water ward to a depth of about 10 meters relative to Mean Lower Low Water (average depth limit of photic zone)

Pelagic – 1) open water areas of lakes, reservoirs, or seas away from shore; 2) refers to organisms at or near the surface in water away from the shore.

Plankton – small plants and animals, generally smaller than 2 mm and without strong locomotive ability, that are suspended in the water column and carried by currents or waves and that may make daily or seasonal movements in the water column

Resilience – the speed at which a habitat, population, or community is able to return to equilibrium following a perturbation

Shoreline - The zone where the ocean is in contact with dry land.

Species richness – a simple measure of species diversity calculated as the total number of species in a habitat or community

Terrestrial – living or occurring on land

Threat – An anthropogenic or natural event, action, structure, or characteristic that is likely or documented to cause harm to a species, population, or ecosystem.

Trophic – related to the processes of energy and nutrient transfer (i.e. productivity) from one level of organisms to another in an ecosystem.

Viable – when referring to a species, capable of living through reproductive age; when referring to a population or ecosystem, able to survive into the foreseeable future at current abundances without external support or immigration.

Terms

Final Environmental Impact Statement (**FEIS**)

Marine Protected Area (**MPA**)

National Oceanic and Atmospheric Administration (**NOAA**)

Puget Sound Water Quality Action Team (**PSWQAT**)

Revised Code of Washington (**RCW**)

State Environmental Protection Act (**SEPA**)

United States Fish and Wildlife Service (**USFWS**)

Washington Administrative Code (**WAC**)

Washington Department of Ecology (**Ecology**)

Washington Department of Natural Resources (**WDNR**)

Washington Department of Fish and Wildlife (**WDFW**)

Washington State Parks and Recreation Commission (**WSP&RC**)

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Appendix I
Aquatic Reserve Technical Advisory Committee
Site Evaluation Form

General Evaluation Criteria

The following criteria will be used to evaluate all potential reserve sites, including environmental reserves, educational reserves, and scientific reserves. Specialized criteria for the latter two categories of reserves (educational and scientific) follow after this list of criteria that apply to all reserve types. Following each evaluation criteria are illustrations of how criteria should be interpreted. Most evaluation criteria are evaluated on a four-point scale: poor, fair, good or excellent. The scoring of these criteria structure the Technical Advisory Committee's evaluation of each site and assist in the formal evaluation of each site for Aquatic Reserve status.

The criteria are drawn directly from the "Non-Project Final Environmental Impact Statement Aquatic Reserves Program Guidance" (the FEIS). The Washington State Department of Natural Resources Aquatic Resources Program published the FEIS on September 6, 2002. The italicized criteria below can be found in section 3.2.1.3.4, Designation Criteria, on pages 21 - 22 of that document.

The ecological and cultural quality of the site

What is the current condition of the site?

- Is the site degraded?

Poor	Fair	Good	Excellent
Site is heavily degraded with more than 50% of the shoreline hardened or otherwise altered.	Site is moderately degraded with 25%-50% of the shoreline hardened or otherwise altered.	Site is minimally degraded with 10 - 25% of the shoreline hardened or otherwise altered, and 75% - 90% of habitat intact.	No noticeable signs of anthropogenic impacts on or near site. Site is considered 'pristine.' Site is not degraded or otherwise altered (0-10% shoreline hardened, 90-100% of habitat intact.)

- Are non-native species found at the site?

Poor	Fair	Good	Excellent
Site is heavily degraded by multiple non-native species. Habitats are being altered as a result of invasion.	Non-native species are abundant at the site and at least one species is considered invasive.	Non-native species are identified at the site, however they are uncommon and none are considered to be invasive.	No non-native species are identified at the site.

- Are there water quality concerns associated with the site? (Water quality concerns may include low dissolved oxygen concentrations in the water column, toxic pollutants in the water column, or elevated risks of algal blooms as a result of anthropogenic inputs).

There are current water quality concerns. The source has not been identified or remediation/ correction or water quality is not improving. **Poor**	There are current water quality concerns. The source has been identified and remediation/ correction have begun and water quality is improving. **Fair**	Water quality is not a current concern at the site; however water pollution or dissolved oxygen concerns have been noted in the area in the past. **Good**	No signs of water pollution exist at the site, nor have any been documented in the past. **Excellent**

- Are there signs of habitat loss within the site?

Evidence of dramatic habitat loss (less than 25% of historic habitat is intact). **Poor**	Evidence of habitat loss is noticeable (25%- 75% of historic habitat is intact). **Fair**	Little evidence of habitat loss as a result of anthropogenic development (75-90% of historic habitat is intact). **Good**	No evidence of habitat loss as a result of anthropogenic development (more than 90% of historic habitat is intact). **Excellent**

- Are ecosystem processes (e.g., freshwater flow, littoral drift, nutrient cycling, etc.) intact?

Many ecosystem processes are not functional. Habitat and ecosystem relies on frequent management interventions to be sustained. **Poor**	Some ecosystem processes are degraded or disrupted. Habitat and ecosystem benefits from occasional management interventions. **Fair**	Some ecosystem processes are degraded or disrupted. Ecosystem appears to be recovering without management interventions. **Good**	No ecosystem processes are noticeably degraded or distrupted. Management interventions would not benefit habitat or ecosystem. **Excellent**

Risks to the ecosystem or feature of interest (If applicable)

- Can threats contributing directly to the area's decline be prevented through reserve establishment?

All threats cannot be mitigated through establishment of reserve. Threats are external to authorization of reserve and must be managed using other tools. **Poor**	Reserve establishment would prevent some, but not all, ecosystem threats occurring within the site. Threats contributing to decline beyond site boundaries would not be directly affected. **Fair**	Reserve establishment would prevent most ecosystem threats occurring within the reserve, and minimize some threats extending beyond site boundaries. **Good**	Reserve establishment would prevent all threats occurring within the site and provide benefits beyond site boundaries. **Excellent**

Restoration potential (If applicable)

- Is there pending restoration at the site?

No restoration plans exist. Transportation or other government infrastructure is highly dependent upon the continued use of the site.	Draft restoration plan exists, but no final plans, nor implementation plan exists. Site includes many landowners and stakeholders with divergent interests in restoration.	Restoration planning is at advanced stages. Restoration process has identified partial funding for restoration.	Restoration process is prepared to proceed. Implementation plan exists, partners are in place and permitting is taking place.
Poor	**Fair**	**Good**	**Excellent**

- Would restoration benefits extend beyond site boundaries?

Restoration benefits are not described with a conceptual model. Restoration benefits uncertain.	Restoration benefits are described with a conceptual model. Restoration benefits primarily benefit within site.	Restoration benefits are described with a conceptual model. Restoration benefits both within and beyond site.
Poor	**Good**	**Excellent**

Special value for biodiversity or species diversity

- Does the site contain or support a large number of species?

Species richness at the site is less than similar sites within the region.	Species richness at the site is similar to other sites within the region.	Species richness at the site exceeds similar sites within the region, however most species are transient or seasonally present.	Resident species richness at the site exceeds similar sites within the region.
Poor	**Fair**	**Good**	**Excellent**

- Does the proposed site capture habitat used regularly by species of special conservation interest?

Habitat is not documented for use during critical life stages of a listed species.	Habitat is used during critical life stages by several species whose populations are not depressed at risk.	Habitat is used during critical life stages by any one species listed in appendix D or E or another reference.	Habitat is used during critical life stages by more than one state or federally threatened or endangered species.
Poor	**Fair**	**Good**	**Excellent**

- Does the proposed site capture vulnerable habitats, life stages or populations? (Vulnerable habitats, life stages or populations include: seal haul-outs, breeding bird aggregations or rookeries, seasonal bird aggregations, seasonal fish aggregations (feeding or breeding), or fish spawning aggregations)

Site is not documented to include any of the described vulnerable habitats, life stages or populations.	Site is documented to support at least one of the described vulnerable life stages.	Site is documented to support at least one of the described vulnerable life stages, and likely to include more than one.	Site is documented to support more than one vulnerable habitat, life stage or population.
Poor	**Fair**	**Good**	**Excellent**

Ecological processes that sustain the aquatic landscape

- Would protection of the site protect/maintain ecological processes?

Establishment of aquatic reserve will not protect any geological, physical, chemical or biological processes within or outside of site. **Poor**	Establishment of aquatic reserve will protect some geological, physical, chemical or biological processes within the site, but will have limited if any impact on processes beyond the site. **Fair**	Establishment of aquatic reserve will protect some geological, physical, chemical or biological processes within the site and some processes beyond the site. **Good**	Establishment of aquatic reserve will protect most geological, physical, chemical or biological processes within the site and some processes beyond the site. **Excellent**

The cultural quality of the site

- Does the site contain or protect significant cultural resources? (Does the site contain heritage, historical, or cultural resources that are eligible for the Washington Register of Historic Places, RCW27.34.220 or the National Register of Historic Places? Evaluate the value of those described in the proposal from a regional or statewide basis (ex. sites listed on the state or national historical register or significant historical indigenous use areas would have high values.)

No sites have been reported at the site. **Poor**	Sites of state importance have been documented at the site. **Good**	Sites of national importance have been documented at the site. **Excellent**

- Has the site yielded or is the site likely to yield information important in prehistory or history

No heritage, historical or cultural features exist at the site. **Poor**	Heritage, historical and/or cultural features are documented to exist at the site. Features are common regionally. **Good**	Heritage, historical and/or cultural features are documented to exist at the site. Features are regionally or nationally important. **Excellent**

Habitats and features represented within the site

Good example (relatively undisturbed) of representative habitat as compared with the overall reserve program goal

- Does the proposed site capture species or habitats that are much less common within the biogeographic region than they were historically?

Habitats found at site are common and there is no evidence of habitat loss. (More than 90% of historic habitat abundance is intact). **Poor**	Habitats found at the site are not common or there is evidence that habitats have declined by 10-25% from historic abundance within biogeographic region. **2 point**	Habitats found at the site are becoming rare, or have declined more than 25-75% from historic abundance within biogeographic region. **Good**	Habitats found at the site are rare or there is evidence of dramatic habitat loss (less than 25% of historic habitat is intact). **Excellent**

Habitat types that are under-represented in the aquatic reserves program or marine protected area network

- Does the site contain representative habitats not otherwise protected in the network of protected areas or aquatic reserves?

All natural habitats found in site are protected within biogeographic region at a level that exceeds their historic representation within biogeographic region or sub-region. **Poor**	All natural habitats found in site are protected within biogeographic region at a level that is comparable to their historic representation within biogeographic region or sub-region. **Fair**	All natural habitats found in site are protected within biogeographic region at a level that is below their historic representation, but comparable to the current representation of habitats within biogeographic region or sub-region. **Good**	All natural habitats found in site are protected within biogeographic region at a level that is below their historic representation and below current representation of habitats within biogeographic region or sub-region. **Excellent**

Biogeographical location that is under-represented in the aquatic reserves program or marine protected area network

- Is the site located in a biogeographic region or sub-region that is underrepresented in the existing reserve network?

5 or more aquatic reserves exist in the biogeographic region or sub-region **Poor**	2-5 or more aquatic reserves exist in the biogeographic region or sub-region **Fair**	1 aquatic reserve exists in the biogeographic region or sub-region. **Good**	No aquatic reserves exist in the biogeographic region or sub-region. **Excellent**

25% or more of the biogeographic region or sub-region is protected in aquatic reserves or other regulatory or proprietary protected areas. **Poor**	10 – 25% of the biogeographic region or sub-region is protected in aquatic reserves or other regulatory or proprietary protected areas. **Fair**	5-10% of the biogeographic region or sub-region is protected in aquatic reserves or other regulatory or proprietary protected areas. **Good**	Less than 5% of the biogeographic region or sub-region is protected in aquatic reserves or other regulatory or proprietary protected areas. **Excellent**

Viability of the occurrences of interest

Site features meet the intent of the reserve

- Are species, habitats or ecosystem processes consistently associated with reserve site?

Habitats, species or processes are ephemeral and are inconsistently found at site. **Poor**	Habitats, species or processes are ephemeral, but are consistently found at site. **Fair**	Habitats, species or processes are seasonal and have been consistently associated with the site. **Good**	Habitats, species or processes are found at the site throughout the year. **Excellent**

Number of conservation targets

- *(SEE "Special value for biodiversity or species diversity")*

Number of ecological processes

- Does the site contain unique or distinctive physical habitat features (e.g., oceanographic gyre, oceanographic sill, natural beach spit, etc)?

No unique or distinctive features are identified. **Poor**	Site includes parts of unique or distinctive features. **Fair**	Site completely surrounds unique or distinctive ecological features. **Good**	Site completely surrounds unique or distinctive ecological features and includes buffers. **Excellent**

- Does the site contain unique or distinctive biological processes (larval rearing zooplankton concentrations, aggregation sites, etc.)?

No unique or distinctive features are identified. **Poor**	Site includes parts of unique or distinctive features. **Fair**	Site completely surrounds unique or distinctive ecological features. **Good**	Site completely surrounds unique or distinctive ecological features and includes buffers. **Excellent**

Defensibility of the site

Complementary protection within a reserve or protected area network

- (See: *Habitat types that are under-represented in the aquatic reserves program or marine protected area network)*

Connectivity to a reserve or protected area network and/or for species and/or habitats

- Does the site provide regional habitat connectivity through any of the following functions: refuge (predator, physiological, high energy), food production, migratory, corridors, spawning, nursery or rearing, riparian vegetation, adult habitat, other functions.

Site appears to be isolated and species neither disperse to or from the site on a consistent basis and the site is not used consistently by species during migration or movements. No connectivity **Poor**	Site is used by a variety of species that remain within the region. Site is not consistently used. Limited regional connectivity not clearly established for any site-associated species. **Fair**	Site is heavily used by one or more species on a consistent seasonal basis, however species appear to be able to use other sites and are not found at the site in abundance every year. Connectivity is established for habitat utilized by site-associated species for more than one function. **Good**	Site is heavily used by one or more species either throughout the year or on a seasonal basis. If site is only used seasonally, the site is used consistently and species movements include the site every year. Connectivity is established for habitat utilized by site-associated species. Connectivity established for multiple functions. **Excellent**

Appropriate size to be sustainable

- Is area large enough to be self-sustaining?

Site is insufficient for internal recolonization. **Poor**	Site is large enough to allow limited internal recolonization. However, disturbance events are likely to disrupt entire site. **Fair**	Site is large enough to allow internal recolonization. Disturbance events are unlikely to disrupt entire site. **Good**	Site is large enough to allow internal recolonization. Disturbance events are unlikely to disrupt entire site. Site supports range of successional communities **Excellent**

Ability to persist over time

- Can site be successfully managed to maintain the features of interest?

Declines in features of interest are caused by factors external to the site. Reserve designation would have no tangible benefits.	Declines in features of interest are strongly influenced by factors external to the site. Reserve designation would provide tangible benefits.	Declines in features of interest are strongly influenced by factors internal to the site. Reserve designation would have tangible benefits within site boundaries.	Declines in features of interest are strongly influenced by factors internal to the site. Reserve designation would have tangible benefits both within and beyond site boundaries.
Poor	**Fair**	**Good**	**Excellent**

- Are there known anthropogenic or natural threats to the continued viability of the site?

Existing modifications at the site, and/or adjacent area(s) to the site, will impact the habitat and functions of over 50%of the proposed reserve.	Existing modifications at the site and/or in adjacent area(s) will impact the habitat and functions of less than 50% of the proposed reserve.	There are no existing modifications in or adjacent to the proposed reserve that will impair the habitat & function of the proposed reserve. Present land use regulations do allow for modifications.	There are no existing modification in or adjacent to the proposed reserve that will impair the habitat & function of the proposed reserve. Existing land use regulations do not permit modification in or adjacent to the site that will impact the habitat & function of the proposed reserve.
Poor	**Fair**	**Good**	**Excellent**

Known or anticipated activities that endanger the site or habitat

- Are proposed land uses or modifications within the proposed reserve compatible with reserve designation? (Modifications of interest are described in Appendix A).

Proposed modifications at the site, and/or adjacent area(s) to the site, will impact the habitat and functions of over 50%of the proposed reserve.	Proposed modifications at the site and/or in adjacent area(s) will impact the habitat and functions of less than 50% of the proposed reserve.	There are no proposed modifications in or adjacent to the site that will impair the habitat & function of the proposed reserve. Present land and water use regulations do allow for modifications.	There are no proposed modification in or adjacent to the site that will impair the habitat and function of the proposed reserve. Land and water use regulations do not permit modifications in or adjacent to the site that will impact the habitat & function of the proposed reserve.
Poor	**Fair**	**Good**	**Excellent**

Potential for factors contributing directly to the area's decline to be prevented

- Would reserve status provide protection for habitats, species or processes of interest from encroachment?

Existing uses at the site, and/or adjacent area(s) to the site, will impact the habitat and functions of more than 50%of the proposed site. **Poor**	Existing uses at the site and/or in adjacent area(s) will impact the habitat and functions of 25-50% of the proposed site. **Fair**	Existing uses at the site and/or in adjacent area(s) will impact the habitat and functions of 0-25% of the proposed site. **Good**	Existing uses, zoning, and land use regulations will complement the proposed site and pose no threats. **Excellent**

Manageability of the site

Coordination with other entities, including local jurisdictions and current leaseholders

- Does the proposal include coordination of reserve actions with other entities, including local jurisdictions and current leaseholders?[1]

Proposal fails to identify any steps for coordination among landowners, stakeholders and regulators. **Poor**	Proposal identifies steps for coordination with regulators, however fails to recognize role of landowners or stakeholders. **Fair**	Proposal identifies steps for coordination with tribes, state agencies, landowners/ stakeholders, education organizations and the public. **Good**

Area previously identified for protection

- Has another entity previously identified this site or areas within the site as a priority for protection? *(Examples include Important Bird Areas (Cullinan 2001), priority areas for Research Natural Area Designation (Dyrness et al. 1975), or priority areas for conservation (e.g., through ecoregional planning, Natural Heritage Program research (Kunze 1984), or similar process (Dethier 1989))*

Site has not been documented as a priority for conservation and does not appear to meet documented conservation planning goals. **Poor**	Site has not been documented as a priority for conservation, however site appears to meet documented conservation goals. **Fair**	Site is included in one planning or priority areas document. Site condition and resources appear to be relatively unchanged since planning effort. **Good**	Site is included in two or more planning or priority areas documents. Site condition and resources appear to be relatively unchanged since planning effort. **Excellent**

[1] This criterion is intended to gauge the amount of planning and effort that has already been invested in the development of a protection plan for the area of interest. These criteria represent best management principles that the Aquatic Reserve program will seek to employ, and will be used to give preference to proposals that are in more advanced stages of development.

Potential cooperative partners for management, monitoring, or enforcement

- Have potential cooperative management partners been identified? [2]

No management, monitoring, nor enforcement partners are identified in proposal. **Poor**	One or more management, monitoring, or enforcement partners are identified. No official letters of support nor commitments are made by potential partners. **Fair**	One or more management, monitoring, or enforcement partners are identified. Official letters of support or commitments are made by at least one potential partner. **Good**	Two or more management, monitoring, or enforcement partners are identified. Official letters of support or commitments are made by at least two potential partners. **Excellent**

Adjacent natural areas or public lands

- Is site adjacent to terrestrial protected areas managed for conservation or restoration purposes?

No terrestrial protected areas are adjacent to site. **Poor**	Terrestrial protected areas are adjacent to less than 25% of the site. **Fair**	Terrestrial protected areas are adjacent to less than 25% to 50% of site. **Good**	Terrestrial protected areas are adjacent to more than 50% of site. **Excellent**

Description of how to measure success (i.e., monitoring)

- *(SEE "Kinds of monitoring needed")*

Kinds of monitoring needed

- Does reserve proposal include a monitoring plan that measures reserve progress towards goals and provides for adaptive management?[3]

Proposal does not include any form of monitoring or adaptive management. **Poor**	Proposal includes adaptive management, but does not include any description of the role of monitoring nor implementation of adaptive management. **Fair**	Proposal describes monitoring plan and adaptive management, but does not describe how monitoring results should be used to influence management. **Good**	Proposal includes monitoring and adaptive management. Plan describes how monitoring results will affect management actions. **Excellent**

[2] This criterion is intended to gauge the amount of planning and effort that has already been invested in the development of a protection plan for the area of interest. These criteria represent best management principles that the Aquatic Reserve program will seek to employ, and will be used to give preference to proposals that are in more advanced stages of development.

[3] This criterion is intended to gauge the amount of planning and effort that has already been invested in the development of a protection plan for the area of interest. These criteria represent best management principles that the Aquatic Reserve program will seek to employ, and will be used to give preference to proposals that are in more advanced stages of development.

Kinds of enforcement needed to make sure incompatible uses and impacts do not encroach on the reserve

- What kind of enforcement is needed to prevent incompatible uses and impacts from encroaching on the reserve?

Active enforcement is a pre-condition for reserve success. **Poor**	Active enforcement would provide benefits not otherwise available. **Fair**	Reserve designation must be accompanied by stakeholder and resource user education to develop best practices. **Good**	Reserve designation alone is sufficient to protect most resources from their primary threats. **Excellent**

Commissioner's Evaluation

Serve or conflict with the greatest public benefit

The Commissioner of Public Lands' evaluation of public benefit will be based on RCW 79.90.45, RCW 79.90.455, and WAC 332-30-106, among other appropriate laws and regulations. In addition, the Commissioner of Public Lands will use the questions below, identified within the FEIS, to assist with the determination of greatest public benefit.

- Does reserve status represent the greatest public benefit?
- Is reserve status compatible with existing or proposed adjacent uses?

Reserve status is incompatible with uses at the site or adjacent to the site. No opportunities identified to change uses at the site or adjacent to the site. **Poor**	Reserve status is incompatible with uses at the site or adjacent to the site. Opportunities identified to change uses at the site or adjacent to the site. **Fair**	Reserve status is compatible with uses at the site and adjacent to the site Long-term compatibility with adjacent uses is uncertain. **Good**	Reserve status is compatible with uses at the site and adjacent to the site Long-term compatibility is established or there is mechanism established to ensure long term compatibility. **Excellent**

- Assess the direct use, indirect use, option, and non-use values associated with the site.

Evaluation Criteria for Scientific Reserves

In addition to the general evaluation criteria that apply to all types of reserves, above, sites proposed as scientific reserves will be evaluated for the following criteria to determine their suitability for designation as a Scientific Reserve. The basis for these criteria for scientific reserves can be found on pages 24 - 25 of the FEIS. In order to minimize redundancy, criteria that have already been evaluated in the general discussion above will not be repeated here.

Objective

Scientific reserves should be established to ensure environmental protection by:

A. Providing sites that can be scientifically manipulated for the benefit of knowledge.
B. Providing reference sites against which to measure effectiveness of environmental protection; and
C. Managing sites with unusually rich plant and animal communities.[4]

Rare site including a wide variety of habitat types and ecological processes

- *(SEE: Overall evaluation criteria – "Special value for biodiversity")*

Relatively undisturbed example of habitat that was common historically

- *(SEE: Overall evaluation criteria – "What is the current condition of the site?")*

*Site is of interest to scientific community**

- Does site represent a unique research opportunity?

Similar research has taken place within the local ecosystem, but not at the proposed site. **Poor**	Similar research has taken place outside of the local ecosystem, however research has not taken place within local system. **Fair**	Research proposal is novel and has not been undertaken. Site provides opportunity to explore ecosystem. **Good**	Research proposal is a continuation or expansion of existing research at or near research site. **Excellent**

Site is unusually species-rich

- Does site exceed expected species richness for areas of similar size? *(e.g. does site contain plant and animal communicates suitable for continuing scientific observations (WAC 332.30.106).*

Site has lower species richness than similar sized areas within biogeographic region. **Poor**	Site has species richness comparable to similar sized areas within biogeographic region. **Fair**	Site has species richness in excess of similar sized areas within biogeographic region. **Good**

[4] FEIS, section 3.2.1.2, page 17.

Viable and manageable site, able to support rare, special, and unique features

- *(SEE: Overall evaluation criteria – "Viability of the occurrences of interest")*

*Site contains a high degree of biodiversity for habitat type**

- Does site exceed expected biodiversity as measured using Shannon's diversity index (an index that measures diversity and evenness of species) for similar habitats?

Habitats have a lower diversity index value than similar habitats within the biogeographic region. **Poor**	Habitats have a comparable diversity index value than similar habitats within the biogeographic region. **Fair**	Habitats have a higher diversity index value than similar habitats within the biogeographic region. **Good**

Site has a low degree of alteration from its natural state

- *(SEE: Overall evaluation criteria – "What is the current condition of the site?")*

*Site could be manipulated without doing irreparable harm to its neighboring systems or habitats in order to advance knowledge (where applicable)**

- Do proposed manipulations affect the physical (e.g., habitat structure or ecosystem processes) or biological composition of the site?

Manipulation significantly disrupts ecosystem processes or physical structure of site. Restoration is uncertain or would take an extended amount of time. **Poor**	Manipulation significantly disrupts ecosystem processes or physical structure of site. Natural recovery is likely and would be rapid. **Fair**	Manipulation primarily affects biological composition of site. Natural recovery is unlikely or would take extended period of time. **Good**	Manipulation primarily affects biological composition of site. Natural recovery is likely and would be rapid. **Excellent**

- Are impacts of manipulation restricted to the site?

Proposed research will cause permanent damage to site and impacts will extend beyond the site. **Poor**	Proposed research will cause some permanent damage to site, however, impacts are likely to be contained within the site. **Fair**	Proposed research will not cause any permanent harm to the site or adjacent area or habitat. **Good**

*Site has a history of monitoring or an opportunity for long term monitoring**

- Does site have a historical monitoring record?

Site has no historical monitoring record, regional monitoring data does not exist. **Poor**	Site has no historical monitoring record, however regional monitoring data does exist. **Fair**	Site has a history of biological and physical process monitoring. Site is not included in regional monitoring programs (e.g., PSAMP). **Good**	Site has a history of biological and physical process monitoring. Site is presently included in regional monitoring programs (e.g., PSAMP). **Excellent**

Evaluation Criteria for Educational Reserves

In addition to the general evaluation criteria that apply to all types of reserves, above, sites proposed as educational reserves will be evaluated for the following specific critera as well. The basis for these criteria for scientific reserves can be found on page 24 of the FEIS. In order to minimize redundancy, criteria that have already been evaluated in the general discussion above will not be repeated here.

Objective

Educational reserves should be established to ensure environmental protection by:

A. Keeping unique aquatic sites available for environmental education opportunities; and
B. Educating people about the value of aquatic habitat to ensure environmental protection.[5]

Network of sites that provides an accessible distribution of sites throughout the state

- Are environmental education reserves available within biogeographic region? (Examples of other education reserves may include areas operated by US Fish and Wildlife Service, National Park Service, Washington State Parks and Recreation or The Nature Conservancy that offer educational curricula)

Site is within 50 miles of another educational reserve within the biogeographic region that provides educational services for substantially comparable habitats. **Poor**	Publicly accessible education reserves exist within biogeographic region that contain substantially comparable habitats, however they are more than 50 miles away. **Fair**	Publicly accessible education reserves exist within biogeographic region, however other reserves represent a substantially different habitat type. **Good**	No publicly accessible education reserves exist within biogeographic region **Excellent**

Network of sites that provides an adequate distribution among habitat types

- Is the proposed site a unique example of habitat available for educational opportunities regionally or statewide?

The habitat is common in the region. There would be several similar sites available for educational purposes. **Poor**	The habitat is common in the region. However, few of the sites that contain the habitat are available for educational purposes. **Fair**	There are only a few of the habitat types proposed for a reserve dispersed across the region or state. **Good**

[5] FEIS, section 3.2.1.2, page 17.

Sites that attract a range of target audiences

- Is the curriculum integrated into an applied educational program (ex. school, public education program, etc.) and tailored to the unique features of the site.

Curriculum is not being developed for application to any existing educational programs and/or specific habitat features. **Poor**	Curriculum is being developed for generic educational application but for no specific habitat features. **Fair**	Curriculum is being developed for a specific educational program for an established educational facility or school system but for no specific habitat features. **Good**	Curriculum is being developed for specific educational program for an established educational facility or school system and tailored for the specific habitat features of the proposed site. **Excellent**

Sites that are compatible with educational use activities

- Are activities and conditions in the areas adjacent to the proposed reserve compatible to the uses proposed for the reserve?

Public access and use of the site may have long-term impacts on the site. Most impacts cannot be prevented through passive site management. **Poor**	Public access and use of the site may have long-term impacts on the site. Most impacts can be prevented through passive site management. **Fair**	Public access and use of the site is unlikely to have any long-term impacts on the site. Site may require partial or complete seasonal closures to avoid disturbing the local environment. **Good**	Public access and use of the site is unlikely to have any long-term impacts on the site. Site can be used for education throughout the year without disturbing environment. **Excellent**

Current site conditions or activities adjacent to the site are compatible with educational reserve

- Are activities and conditions in the areas adjacent to the proposed reserve compatible to the uses proposed for the reserve?

Adjacent uses and activities are not compatible with educational activities or environmental preservation. **Poor**	Adjacent uses and activities are mostly compatible with educational activities but may not be compatible with environmental preservation. **Fair**	Adjacent uses and activities are compatible with educational activities and presently compatible with environmental preservation (ex. existing zoning not compatible) **Good**	Adjacent uses and activities complement educational activities and support continuing environmental preservation of the site and adjacent areas. **Excellent**

Site whose ecological integrity can be preserved while providing public access

- How will the proponent maintain the unique ecological features of the site while providing public access for education program.

Actions are not adequately addressed or established to ensure compatibility of ecological integrity and public access. **Poor**	Actions are addressed or established, but with no assurance that ecological integrity will be maintained. **Fair**	Actions are addressed and established that support the environmental goals of the reserve and promote public access with attention to impacts to the site's ecological integrity **Good**

Site has a history of monitoring and an opportunity for long-term monitoring. (Criterion applicable in cases described by FEIS 3.2.1.4.3).

- Does site have a historical monitoring record?

Site has no historical monitoring record, and regional monitoring data does not exist. **Poor**	Site has no historical monitoring record, however regional monitoring data does exist. **Fair**	Site has a history of biological and physical process monitoring. Site is not included in regional monitoring programs (e.g., PSAMP). **Good**	Site has a history of biological and physical process monitoring. Site is presently included in regional monitoring programs (e.g., PSAMP). **Excellent**

APPENDIX A
Potential Causes of Habitat Modification & Threats

1) Adjacent residential upland development *
2) Adjacent industrial upland development *
3) Adjacent agricultural upland development *
4) Over water structures *
5) Shoreline armoring
6) Slope/bank stabilization
7) In water development (marinas, port facilities, boat ramps, marine repair facilities, etc.) *
8) Sewer outfalls *
9) Storm water outfalls
10) Mooring buoys
11) Derelict vessels
12) Submerged vessels
13) Fill
14) Underwater disposal sites
15) Contaminated sediment
16) Dredged areas
17) Revetments *
18) Piles
19) Nuisance species
20) Water Quality
21) Other

* Source: Final Report – Northwest Straits Nearshore Habitat Evaluation, prepared for the Northwest Straits Commission, prepared by Anchor Environmental, L.L.C. and People for Puget Sound. January 2002.

APPENDIX B
Priority Marine Habitat

DNR's responsibility is to manage aquatic habitat on state-owned aquatic lands. Our priorities are driven by the use of this habitat by aquatic species that are not managed by DNR.

DNR designated sensitive marine habitat:
Source: Washington Department of Natural Resources, Aquatic Resources Management Reference Manual, section 20.1 (rev. date 9/94)

Vegetated Marine Estuarine: Includes eelgrass meadows, kelp beds and turf algae in the intertidal and subtidal to a depth of approximately 30.5 meters below mean lower, low water. Priority is also given to maintaining the following physical parameters necessary for kelp and eelgrass survival and growth: substrate, wave exposure/energy, salinity, light level, and nutrients.

- Kelp (*Macrocystis* and/or *Nereocystis*): Patches of sedentary floating aquatic vegetation.
- Eelgrass (genus *Zostera*): Habitat consisting of intertidal and shallow subtidal shores that are colonized by rooted vascular angiosperms of the genus *Zostera*.
- Commonly used forage fish spawning structural habitat for fish stocks identified by WDFW in the 1996 Forage Fish Stock Status Report (or updated edition).
- Habitat documented for use during critical life stages of priority aquatic species (ex. refuge, forage areas, concentrated migratory corridor use versus lower value for passage, spawning, rearing, riparian habitat, adult habitat)
- Turf algae: Habitats consisting of non-emergent green, red, and/or brown algae plants growing on solid substrates rocks, shell, hardpan).
- Native (unaltered) Estuarine Mudflats
- Gravel beaches – low energy, high energy
- Sand beaches – low energy, high energy

Marine priority habitat
Source: Washington Department of Fish and Wildlife, Priority Habitat and Species (http://www.wa.gov/wdfw/hab/phshabs/htm)

Estuary, estuary-like:

- Deepwater tidal habitats and adjacent tidal wetlands usually semi-enclosed by land but with open, partly obstructed or sporadic access to the open marine waters, where marine water is at least occasionally diluted by terrestrial freshwater runoff (not including non-point sources. ex. stormwater runoff, sewer outfall).

Marine/Estuary Shorelines:

- Shorelines include the intertidal and subtidal zones of beaches. Backshore and adjacent components of the terrestrial landscape (such as cliffs, snags, mature trees, dunes, meadows) are important associated habitat for fish and contribute to marine/estuary shoreline function (such as sand/rock/log recruitment, nutrient contribution, erosion control). Though these areas may not be state-owned aquatic lands, and therefore, not included in the aquatic reserves, they may be significant adjacent habitat that are critical to the function of the reserve.

- **Consolidated substrate**: Rocky outcroppings in the intertidal and subtidal marine/estuarine environment consisting of rocks greater than 25 cm (10 inches) diameter, hardpan, and/or bedrock. **Unconsolidated Substrate**: Substrata in the intertidal and subtidal marine environment consisting of rocks less than 25 cm diameter, gravel, shell, sand, and/or mud.

Riparian:

- Area adjacent to marine shorelines that contain elements of both the aquatic and terrestrial ecosystems that mutually influence each other. Riparian habitat encompasses the area beginning at the ordinary high water mark and extends to the portion of the terrestrial landscape that is influenced by the aquatic system.

APPENDIX C
Priority Freshwater Habitat

Source: Washington Department of Fish and Wildlife, Priority Habitat and Species (http://www.wa.gov/wdfw/hab/phshabs/htm)
Note: These areas may not be on state-owned aquatic lands, and therefore, not included in the aquatic reserves. If not, they should be considered significant adjacent habitat that are critical to the function of the reserve.

Freshwater Wetlands and Fresh Deepwater:

- Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands must have one or more of the following attributes: the land supports, at least periodically, predominantly hydrophytic plants; substrate is predominantly undrained hydric soils; and/or the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

- Deepwater habitats are permanently flooded lands lying below the deepwater boundary of wetlands. Deepwater habitats include environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live. The dominant plants are hydrophytes; however, the substrates are considered nonsoil because the water is too deep to support emergent vegetation. These habitats include all underwater structures and features (e.g., woody debris, rock piles, caverns).

Instream:

- The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and invertebrate resources.

Riparian:

- The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other. In riparian systems, the vegetation, water tables, soils, microclimate, and wildlife inhabitants of terrestrial ecosystems are influenced by perennial or intermittent water. Simultaneously, the biological and physical properties of the aquatic ecosystems are influenced by adjacent vegetation, nutrient and sediment loading, terrestrial wildlife, as well as organic and inorganic debris. Riparian habitat encompasses the area beginning at the ordinary high water mark and extends to that portion of the terrestrial landscape that is influenced by, or that directly influences, the aquatic ecosystem. Riparian habitat includes the entire extent of the floodplain and riparian areas of wetlands that are directly connected to stream courses.

APPENDIX D
Priority Marine Species

Priority habitat and species lists are dynamic and because the Department of Natural Resources does not administer any lists of priority species, reference is made to three sources that DNR will use as the sources for its Priority Marine Species lists. Priority marine species are identified from the following three sources: Washington Department of Fish and Wildlife – Species of Concern in Washington State; NatureServe, At Risk Species – Priorities 1-3; Washington Department of Fish and Wildlife Fish Stock Status Reports, Species with critical stock status.

Source: Washington Department of Fish and Wildlife, Species of Concern in Washington State (June 2002) (http://www.wa.gov/wdfw/wlm/diversity/soc/soc/htm)

Status Codes: (priorities value in descending order. More value if habitat has documented use for critical life stages (ex. spawning, rearing, concentrated use versus lower value for passage)

1. FE: Federal Endangered
2. FT: Federal Threatened
3. SE: State Endangered
4. ST: State Threatened
5. FC: Federal Candidate
6. SC: State Candidate
7. None: No listing status

Fish (any documented occurrence)

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS
BLACK ROCKFISH	*SEBASTES MELANOPS*	SC	none
BOCACCIO ROCKFISH	*SEBASTES PAUCISPINIS*	SC	none
BROWN ROCKFISH	*SEBASTES AURICULATUS*	SC	none
BULL TROUT (COASTAL/PUGET SOUND)	*SALVELINUS CONFLUENTUS*	SC	FT
CANARY ROCKFISH	*SEBASTES PINNIGER*	SC	none
CHINA ROCKFISH	*SEBASTES NEBULOSUS*	SC	none
CHINOOK SALMON (PUGET SOUND ESU)	*ONCORHYNCHUS TSHAWYTSCHA*	SC	FT
CHUM SALMON (HOOD CANAL ESU)	*ONCORHYNCHUS KETA*	SC	FT
COPPER ROCKFISH	*SEBASTES CAURINUS*	SC	none
EULACHON	*THALEICHTHYS PACIFICUS*	SC	none
GREENSTRIPED ROCKFISH	*SEBASTES ELONGATUS*	SC	none
PACIFIC COD (S&C PUGET SOUND)	*GADUS MACROCEPHALUS*	SC	none
PACIFIC HAKE (C. PUGET SOUND)	*MERLUCCIUS PRODUCTUS*	SC	none
PACIFIC HERRING (CHERRY POINT)	*CLUPEA PALLASI*	SC	none
PACIFIC HERRING (DISCOVERY BAY)	*CLUPEA PALLASI*	SC	none
QUILLBACK ROCKFISH	*SEBASTES MALIGER*	SC	none
REDSTRIPE ROCKFISH	*SEBASTES PRORIGER*	SC	none
TIGER ROCKFISH	*SEBASTES NIGROCINCTUS*	SC	none
UMATILLA DACE	*RHINICHTHYS UMATILLA*	SC	none
WALLEYE POLLOCK (SO. PUGET SOUND)	*THERAGRA CHALCOGRAMMA*	SC	none
WIDOW ROCKFISH	*SEBASTES ENTOMELAS*	SC	none
YELLOWEYE ROCKFISH	*SEBASTES RUBERRIMUS*	SC	none
YELLOWTAIL ROCKFISH	*SEBASTES FLAVIDUS*	SC	none

Fish (breeding areas, documented regular large concentrations)

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS
PACIFIC HERRING	*CLUPEA PALLASI*	none	none
LONGFIN SMELT	*SPIRINCHUS THALEICHTHYS*	None	none
SURFSMELT	*HYPOMESUS PRETIOSUS*	None	none
PACIFIC SAND LANCE	*AMMODYTES HEXAPTERUS*	None	none

Mammals (documented regular occurrence)

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS
BLACK RIGHT WHALE	*BALAENA GLACIALIS*	SE	FE
FIN WHALE	*BALAENOPTERA PHYSALUS*	SE	FE
HUMPBACK WHALE	*MEGAPTERA NOVAEANGLIAE*	SE	FE
KEEN'S MYOTIS	*MYOTIS KEENII*	SC	none
KILLER WHALE	*ORCINUS ORCA*	SC	none
PACIFIC HARBOR PORPOISE	*PHOCOENA PHOCOENA*	SC	none
SEA OTTER	*ENHYDRA LUTRIS*	SE	none
SEA OTTER	*ENHYDRA LUTRIS LUTRIS*	SE	none
SEI WHALE	*BALAENOPTERA BOREALIS*	SE	FE

Mollusk (documented natural occurrence)

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS
NORTHERN ABALONE	*HALIOTIS KAMTSCHATKANA*	SC	none
OLYMPIA OYSTER	*OSTREA LURIDA*	SC	none

Marine Birds (Breeding areas, areas of documented regular large concentrations)

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS
AMERICAN WHITE PELICAN	*PELECANUS ERYTHRORHYNCHOS*	SE	none
BRANDT'S CORMORANT	*PHALACROCORAX PENICILLATUS*	SC	none
BROWN PELICAN	*PELECANUS OCCIDENTALIS*	SE	FE
CASSIN'S AUKLET	*PTYCHORAMPHUS ALEUTICUS*	SC	FC
COMMON LOON	*GAVIA IMMER*	SS	none
COMMON MURRE	*URIA AALGE*	SC	none
ALEUTIAN CANADA GOOSE	*BRANTA CANADENSIS LEUCOPAREIA*	ST	none
MARBLED MURRELET	*BRACHYRAMPHUS MARMORATUS*	ST	FT
SNOWY PLOVER	*CHARADRIUS ALEXANDRINUS*	SE	FT
TUFTED PUFFIN	*FRATERCULA CIRRHATA*	SC	FC
UPLAND SANDPIPER	*BARTRAMIA LONGICAUDA*	SE	none
WESTERN GREBE	*AECHMOPHORUS OCCIDENTALIS*	SC	none

APPENDIX E
Priority Freshwater Species

Priority habitat and species lists are dynamic and because the Department of Natural Resources does not administer any lists of priority species, reference is made to three sources that DNR will use as the sources for its Priority Marine Species lists. Priority marine species are identified from the following three sources: Washington Department of Fish and Wildlife – Species of Concern in Washington State; NatureServe, At Risk Species – Priorities 1-3; Washington Department of Fish and Wildlife Fish Stock Status Reports, Species with critical stock status.

Source: Washington Department of Fish and Wildlife, Species of Concern in Washington State (June 2002) (http://www.wa.gov/wdfw/wlm/diversity/soc/soc/htm)

COMMON NAME	SCIENTIFIC NAME	ANIMAL TYPE	STATE STATUS	FEDERAL STATUS
CASCADE TORRENT SALAMANDER	*RHYACOTRITON CASCADAE*	Amphibian	SC	none
COLUMBIA SPOTTED FROG	*RANA LUTEIVENTRIS*	Amphibian	SC	FC
DUNN'S SALAMANDER	*PLETHODON DUNNI*	Amphibian	SC	none
LARCH MOUNTAIN SALAMANDER	*PLETHODON LARSELLI*	Amphibian	SS	FC
NORTHERN LEOPARD FROG	*RANA PIPIENS*	Amphibian	SE	none
OREGON SPOTTED FROG	*RANA PRETIOSA*	Amphibian	SE	FC
BULL TROUT	*SALVELINUS CONFLUENTUS*	Fish	SC	FT
BULL TROUT (COLUMBIA BASIN)	*SALVELINUS CONFLUENTUS*	Fish	SC	FT
CHINOOK SALMON (LOWER COLUMBIA)	*ONCORHYNCHUS TSHAWYTSCHA*	Fish	SC	FT
CHINOOK SALMON (SNAKE R. FALL)	*ONCORHYNCHUS TSHAWYTSCHA*	Fish	SC	FT
CHINOOK SALMON (SNAKE R. SP/SU)	*ONCORHYNCHUS TSHAWYTSCHA*	Fish	SC	FT
CHINOOK SALMON (UPPER COLUMBIA SP)	*ONCORHYNCHUS TSHAWYTSCHA*	Fish	SC	FE
CHUM SALMON (LOWER COLUMBIA)	*ONCORHYNCHUS KETA*	Fish	SC	FT
KOKANEE (LANDLOCKED SOCKEYE)	*ONCORHYNCHUS NERKA*	Fish	SC	FT
LAKE CHUB	*COUESIUS PLUMBEUS*	Fish	SC	none
LEOPARD DACE	*RHINICHTHYS FALCATUS*	Fish	SC	none
MARGINED SCULPIN	*COTTUS MARGINATUS*	Fish	SS	FC
MOUNTAIN SUCKER	*CATOSTOMUS PLATYRHYNCHUS*	Fish	SC	none
RIVER LAMPREY	*LAMPETRA AYRESI*	Fish	SC	FC
SOCKEYE SALMON (SNAKE R.)	*ONCORHYNCHUS NERKA*	Fish	SC	FE
STEELHEAD (LOWER COLUMBIA)	*ONCORHYNCHUS MYKISS*	Fish	SC	FT
STEELHEAD (MIDDLE COLUMBIA)	*ONCORHYNCHUS MYKISS*	Fish	SC	FT
STEELHEAD (SNAKE RIVER)	*ONCORHYNCHUS MYKISS*	Fish	SC	FT
STEELHEAD (UPPER COLUMBIA)	*ONCORHYNCHUS MYKISS*	Fish	SC	FE
CALIFORNIA FLOATER	*ANODONTA CALIFORNIENSIS*	Mollusk	SC	FC
GIANT COLUMBIA RIVER LIMPET	*FISHEROLA NUTTALLI*	Mollusk	SC	none
GIANT COLUMBIA SPIRE SNAIL	*FLUMINICOLA COLUMBIANA*	Mollusk	SC	FC
NEWCOMB'S LITTORINE SNAIL	*ALGAMORDA SUBROTUNDATA*	Mollusk	SC	FC
WESTERN POND TURTLE	*CLEMMYS MARMORATA*	Reptile	SE	FC

Status Codes: (priorities value in descending order. More value if habitat has documented use for critical life stages (ex. spawning, rearing, concentrated use versus lower value for passage)

1. FE: Federal Endangered
2. FT: Federal Threatened
3. SE: State Endangered
4. ST: State Threatened
5. FC: Federal Candidate
6. SC: State Candidate
7. None: No listing status

(any documented occurrence)

APPENDIX F
Site Evaluation Form Scoresheet

Aquatic Reserve Site Evaluation Form
Score Sheet

Category	Question	Score			
		Poor	Fair	Good	Excellent
Ecological Quality Criteria					
What is the current condition of the site?	Is the site degraded?				
	Are non-native species found at the site?				
	Are there water quality concerns associated with the site?				
	Are there signs of habitat loss within the site?				
	Are ecosystem processes (e.g., freshwater flow, littoral drift, nutrient cycling, etc.) intact?				
Risks to the ecosystem or feature of interest	Can threats contributing directly to the area's decline be prevented through reserve establishment?				
Restoration potential	Is there pending restoration at the site?				
	Would restoration benefits extend beyond site boundaries?				
Special value for biodiversity or species diversity	Does the site contain or support a large number of species?				
	Does the proposed site capture habitat used regularly by species of special conservation interest?				
	Does the proposed site capture vulnerable habitats, life stages or populations?				
Ecological processes that sustain the aquatic landscape	Would protection of the site protect/maintain ecological processes?				
Good example (relatively undisturbed) of representative habitat as compared with the overall reserve program goal	Does the proposed site capture species or habitats that are much less common within the biogeographic region than they were historically?				
Habitat types that are under-represented in the aquatic reserves program or marine protected area network	Does the site contain representative habitats not otherwise protected in the network of protected areas or aquatic reserves?				
Biogeographical location that is under-represented in the aquatic reserves program or marine protected area network	Is the site located in a biogeographic region or sub-region that is underrepresented in the existing reserve network?				
Site features meet the intent of the reserve	Are species, habitats or ecosystem processes consistently associated with reserve site?				
Number of conservation targets	See 'Special value for biodiversity or species diversity'				
Number of ecological processes	Does the site contain unique or distinctive physical habitat features?				
	Does the site contain unique or distinctive biological processes?				
Connectivity to a reserve or protected area network and/or for species and/or habitats	Does the site provide regional habitat connectivity				
Appropriate size to be sustainable	Is area large enough to be self-sustaining?				
Socioeconomic Criteria					
The cultural quality of the site	Does the site contain or protect significant cultural resources?				
	Has the site yielded or is the site likely to yield information important in prehistory or history				
Serve or conflict with the greatest public benefit	Does reserve status represent the greatest public benefit?				
	Is reserve status compatible with existing or proposed adjacent uses?				
	Assess the direct use, indirect use, option, and non-use values associated with the site.				
Manageability Criteria					
Complementary protection within a reserve or protected area network	See 'Habitat types that are under-represented in the aquatic reserves program or marine protected area network'				
Ability to persist over time	Can site be successfully managed to maintain the features of interest?				
	Are there known anthropogenic or natural threats to the continued viability of the site?				
Known or anticipated activities that endanger the site or habitat	Are proposed land OR water dependent uses or modifications compatible with reserve designation?				
Potential for factors contributing directly to the area's decline to be prevented	Would reserve status provide protection for habitats, species or processes of interest from encroachment?				
Coordination with other entities, including local jurisdictions and current leaseholders	Does the proposal include coordination of reserve actions with other entities, including local jurisdictions and current leaseholders?				

Aquatic Reserve Site Evaluation Form
Score Sheet

Category	Question	Score			
		Poor	Fair	Good	Excellent
Area previously identified for protection	Has another entity previously identified this site or areas within the site as a priority for protection?				
Potential cooperative partners for management, monitoring, or enforcement	Have potential cooperative management partners been identified?				
Adjacent natural areas or public lands	Is site adjacent to terrestrial protected areas managed for conservation or restoration purposes?				
Description of how to measure success (i.e., monitoring)	SEE "Kinds of monitoring needed"				
Kinds of monitoring needed	Does reserve proposal include a monitoring plan that measures reserve progress towards goals and provides for adaptive management?				
Kinds of enforcement needed to make sure incompatible uses and impacts do not encroach on the reserve	What kind of enforcement is needed to prevent incompatible uses and impacts from encroaching on the reserve?				
Scientific Research Critieria					
Rare site including a wide variety of habitat types and ecological processes	SEE: Overall evaluation criteria – "Special value for biodiversity")				
Relatively undisturbed example of habitat that was common historically	SEE: Overall evaluation criteria – "What is the current condition of the site				
Site is of interest to scientific community	Does site represent a unique research opportunity?				
Site is unusually species-rich	Does site exceed expected species richness for areas of similar size?				
Viable and manageable site, able to support rare, special, and unique features	SEE: Overall evaluation criteria – "Viability of the occurrences of interest"				
Site contains a high degree of biodiversity for habitat type	Does site exceed expected biodiversity for similar habitats				
Site has a low degree of alteration from its natural state	SEE: Overall evaluation criteria – "What is the current condition of the site?"				
Site could be manipulated without doing irreparable harm to its neighboring systems or habitats in order to advance knowledge	Do proposed manipulations affect the physical or biological composition of the site?				
	Are impacts of manipulation restricted to the site?				
Site has a history of monitoring or an opportunity for long term monitoring	Does site have a historical monitoring record?				
Education Criteria					
Network of sites that provides an accessible distribution of sites throughout the state	Are environmental education reserves available within biogeographic region?				
Network of sites that provides an adequate distribution among habitat types	Is the proposed site a unique example of habitat available for educational opportunities regionally or statewide?				
Sites that attract a range of target audiences	Is the curriculum integrated into an applied educational program (ex. school, public education program, etc.) and tailored to the unique features of the site.				
Sites that are compatible with educational use activities	Are activities and conditions in the areas adjacent to the proposed reserve compatible to the uses proposed for the reserve?				
Current site conditions or activities adjacent to the site are compatible with educational reserve	Are activities and conditions in the areas adjacent to the proposed reserve compatible to the uses proposed for the reserve?				
Site whose ecological integrity can be preserved while providing public access	How will the proponent maintain the unique ecological features of the site while providing public access for education program.				
Site has a history of monitoring and an opportunity for long-term monitoring	Does site have a historical monitoring record?				